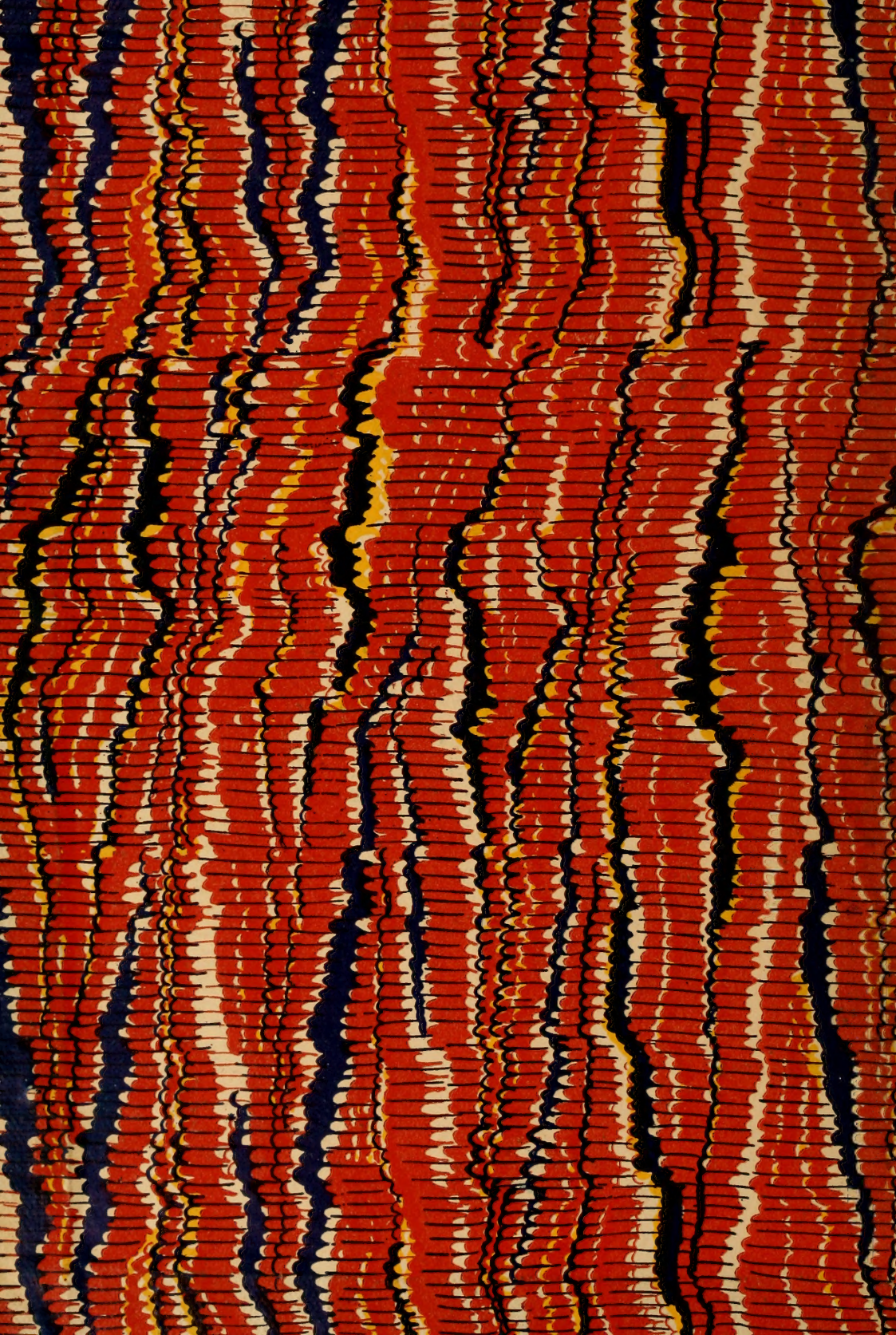




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VOLUME IV. ERRATA.

The plate of *Gymnodactylus condorensis* and *Gonatodes glaucus* in No. 2 is not numbered.

The explanation of Plate V. Fig. 2. should read *Penthema binghami mimetica* Lathy. ♂.

P. 45, line 10, for *L. begini* read '*P. begini*'.
P. 81, „ 6, for '*M. atriceps irus*' read '*M. irus atriceps*'.
P. 115, „ 25, for 'laterae' read 'latum'.
27, for '6, remotis' read '6 remotis,'.
34, insert 'ut' between 'basin' and 'videtur'.
P. 116, „ 1, for 'augustus' read 'angustis'.
P. 117, last line, for 'leasali' read 'basali'.
P. 118, line 2, for '.2mm.' read '2mm'.
P. 119, „ 23, for '.7 read 7'; line 28, for '.5 read 5'.
P. 120, „ 29, for '.7 read 7'; line 30 and 31, for '.5 read 5'.
P. 121, „ 2 and 16, for '.5' read '5'.
17, for 'augusta' read 'angusta'.
P. 126, „ 10, for 'TIMBRISTYLIS' read 'FIMBRISTYLIS'.
P. 127, „ 14, before '5.5 — 10 cm.' insert 'Lamina.'
P. 128, „ 31, after 'India' add 'Java'.
P. 129, „ 1, after 'India' add 'S. China, Tonkin'.
P. 130, „ 11, for 'ANNAMENSIS' read 'ANNAMENSE'.
P. 132, „ 5, for 'SAXIFRAGACEÆ' read 'DROSERACERÆ'.
P. 135, „ 17, for 'in' read 'ex'.
18, for 'tenuissimi ebracteolati multo' read 'tenues ebracteolata flores multo'.
P. 137, „ 6, for 'ind. Or' read 'India'.
13, for 'divisæ' read 'onustæ'.
P. 151, „ 1, for '6' read '.6.'
P. 153, „ 3, for 'BOERHAAVIA' read 'BOERHAVIÆFOLIA'.
31, for 'minuti' read 'muniti'.
P. 155, „ 15, for 'ANNAMENSIS' read 'ANAMENSIS'.
P. 157, „ 6, for '85' read '8.5'.
26, for 'loniorem' read 'longiorem'.
P. 158, „ 23, for 'MELANTHESOPSIS' read 'MELANTHESIOPSIS'.
P. 160, „ 2, for 'Formoso' read 'Formosa'.

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THE APPLE-SNAILS OF SIAM.

By N. Annandale, D. Sc., F.A.S.B.,

(Zoological Survey of India).

With 2 plates.

The Ampullariidae or Apple-Snails are the largest of the freshwater Gastropod molluscs and can as a rule be recognized by their comparatively great size and by their almost globular shells. Even the smaller forms are considerably larger than most other water-snails, but a few gigantic Pond-Snails (Viviparidae), found mostly in China, are larger than the smallest species, and approach the Ampullariidae in shape of shell. The Oriental Apple-Snails can, however, be readily distinguished from all others of large or moderate size found with them by their thick shelly opercula, and by the fact that they possess, in addition to the ordinary tentacles, a tentacle-like process on either side of the mouth. They are found in ponds, marshes, rice-fields and sluggish streams, where aquatic vegetation grows luxuriantly, for they are voracious feeders and their chief food consists of water-plants, which they masticate by means of a pair of stout horny jaws, situated laterally, as well as scraping them with the teeth of their lingual ribbon, which are unusually large. On occasion they will eat decaying animal matter, including the bodies of their own kind, and some species rasp small algae from the shells of their fellows, causing unsightly patches as they remove the epidermis or periostracum with the algae.

The breathing apparatus of these snails is of complex structure and the branchial chamber is divided into two parts, one of which may be described as a lung for breathing air, while the other is a cavity in which it is supposed that oxygen can be extracted from water. They are, however, practically air-breathers, and may be observed to rise to the surface from time to time and thrust out through the surface-film a stout funnel-shaped siphon, through which they draw air into their lung.

In countries that have a dry and a wet season, the Ampullariidae aestivate or hibernate in the former, burying themselves in the ground, where they remain in a comatose condition, with the operculum tightly closing the shell, until rain falls.

The shell does not increase in size while the animal is inactive; indeed, growth seems to be limited to the early part of the active season. A growing shell can usually be recognized by the extreme thinness of the free margin of its mouth.

The eggs are large and have a brittle, white, calcareous shell. Some species lay them in irregular masses in depressions in the ground, while others attach them to the tree-trunks, posts, etc., at the edge of water. In the former case the eggs are spherical and adhere together lightly, in the latter they may be so closely compacted as to be irregular in form. In one Siamese species (*Pachylabra turbinis*) only the inner eggs of the mass are fertile, the outer eggs being degenerate and forming a protective covering for the fertile ones.

Only one genus is at present recognized among the Oriental Ampullariidae, but it will probably be necessary to separate a small Indian species (*Ampullaria nux* Reeve) on anatomical grounds. This species differs from its present congeners in living in small mountain torrents. There has been much dispute within the last few years as to the generic, and hence the family, name of the ordinary species. Until recently all those forms the shell of which has a right-handed spiral were known as *Ampullaria* Lamarck (1799), and the family as Ampullariidae; the genus was believed to be of circumtropical range. But there can be no doubt (1) that the type-species of *Ampullaria* was (though Lamarck was

ignorant of the fact) a West Indian form, and (2) that the Neotropical species differ from those of Africa and Asia in having a horny instead of a calcareous operculum, and in the fact that the siphon when expanded is an elongate cylindrical tube many times as long as thick, whereas that of the Oriental and African species is in the same condition no longer than broad and distinctly funnel-shaped. These characters seem to be of generic importance.

Granting that these species are generically distinct from the American ones, and that the name *Ampullaria* properly belongs to the latter, recent writers adopt one of two generic names for the African and Oriental species, either *Pila* Bolton (1798) or *Pachylabra* Swainson (1840). *Pila*, as Kobelt[1] has shown, is inadmissable and I have, therefore, adopted the name *Pachylabra*. This course leaves the family name Ampullariidae intact.

In describing the Siamese species of *Pachylabra* I have had in my hands material from the following sources:—

(1) The old collection of the Indian Museum, discussed in Nevill's "Hand List" (1884).

(2) A fine series of shells of *P. turbinis* var. *dalyi* from Pitsanuloke presented to the Indian Museum some years ago by Mr. H. W. Biggie of the Indian Forest Service.

(3) A small collection made by myself in the province of Singgora (Songkla) in 1916.

(4) Another recently made by Mr. C. Boden Kloss in the Korat district and on Koh Samesan in the Gulf of Siam, and presented to the Indian Museum by him.

(5) A series of shells and living specimens of the new species *P. angelica* sent me from Bangkok by Dr. Malcolm Smith in July, 1919.

I have to thank those who have provided much of this valuable material, and also Dr. Baini Prashad of the Bengal Fishery Department, who has sketched the radulae figured in this paper

1 Kobelt, Fam. *Ampullariidae* in Martini and Chemnitz's *Conch.-Cab.*, p. 44 (1911). See also Dall, *Journ. Conch.* (London) II. p. 50 (1904).

and has given me other assistance. The drawings and photographs, here reproduced, have been prepared by the artists of the Zoological Survey of India.

The Zoological Survey of India would be very grateful for further specimens from any part of Siam, as they would be of great assistance in the survey of the freshwater molluscs of the Indian Empire that we are at present undertaking. Living snails will travel safely in a dry condition to Calcutta by post, as those sent me by Dr. Malcolm Smith have proved.

Pachylabra Swainson.

1911. *Pachylabra*, Kobelt, Fam. *Ampullariidae* in Martini and Chemnitz's *Conch. Cab.*, p. 44.

In this genus are included all the normally right-handed species of Ampullariidae that have a calcareous operculum. It is necessary to insert the word "normally", because in certain species (*e. g.* the common Indian *P. globosa*) abnormal shells occur (very rarely) that have a left-handed spiral. Information is not available as to the anatomy of such aberrant individuals, but in the African genus *Meladomus*, in which a left-handed spiral is a normal generic character, the shell is said to be hyperstrophic and the anatomy of the animal is not reversed.

The range of the genus is strictly tropical. In India it does not extend into the Punjab, though it embraces the whole of the plains of the Gangetic system and the greater part of South India. Generally speaking it may be defined as consisting of the Ethiopian and Oriental Regions, including Madagascar, with the exception of desert and mountainous areas. In Siam at least seven species are found. In "Etudes diverses" of the Mission Pavie to Indo-China (Vol III, 1904, p. 425) Fischer and Dautzenberg give the following particulars of species recorded from Siam:—

P. borneensis (Philippi)	from Bangkok & Chengmai
? *P. celebensis* (Quoy & Gaimard)	„ "Siam"
? *P. conica.* (Gray)	„ „
P. globosa (Swainson)	„ (The marshes of the Menam near Bangkok).



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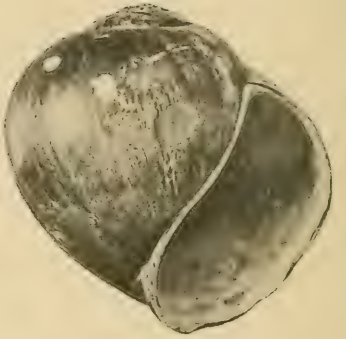
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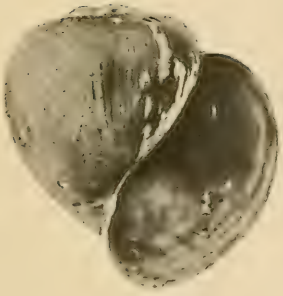
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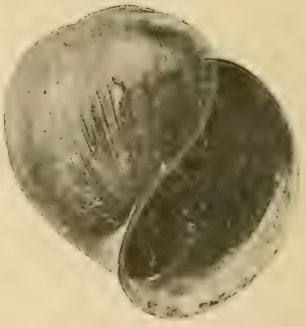
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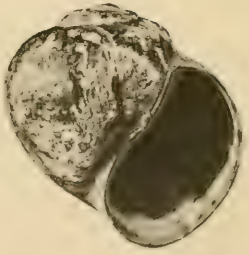
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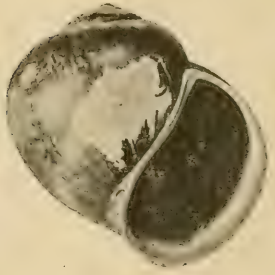
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12.



9.



10.

S. C. Mondul Photo.

SIAMESE AMPULLARIIDÆ.

DESCRIPTION OF PLATE I.

Pachylabra polita (Deshayes).

Fig. 1. Large shell from Cambodia. Half natural size.

Fig. 2. Type—specimen of var. *compressus* Nevill, from Cambodia. Half natural size.

Pachylabra conica (Gray).

Fig. 3. Shell from Pegu, Burma. Two-thirds natural size.

Pachylabra gracilis (Lea).

Fig. 4. Shell from Siam. Natural size.

Pachylabra turbinis (Lea).

Fig. 5. Type-specimen of var. *subglobosa*, Nevill. ?From Siam. Half natural size.

Pachylabra turbinis var. **dalyi** (Blanford).

Fig. 6. Large shell from Pitsanuloke, Siam. Half natural size.

Pachylabra turbinis var. **subampullacea,** Nevill.

Fig. 7. Large shell from Lampam, Patalung, Siam. Half natural size.

Pachylabra turbinis var. **lacustris,** nov.

Fig. 8. Type-specimen from the Tale Sap, near Lampam, Siam. Half natural size.

Pachylabra angelica, sp. nov.

Figs. 9, 10. Type-specimens from Bangkok. Half natural size.

Pachylabra begini (Morlet.)

Fig. 11. Shell from Korat district. Two-thirds natural size.

Pachylabra pesmei (Morlet).

Fig. 12. Shell from Koh Samesan off C. Liant, Gulf of Siam Natural size.

P. gracilis (Lea)	from "Siam"
P. pesmei (Morlet)	„ Srakao
P. polita (Deshayes)	„ Chengmai
P. turbinis (Lea)	„ "Siam"

The occurrence of *P. borneensis* [the synonomy of which is still doubtful], of *P. celebensis* [=*P. ampullacea* (L.)] and of *P. globosa* in Siam is most improbable. The two former are species found in the Malay Archipelago and are known to have been often confused with mainland forms. *P. globosa* is the common form in the valley of the Ganges. The species here described as *P. angelica* may have been confused with it.

The late Dr. W. T. Blanford, who was well acquainted with the Indian and Burmese species and varieties, recorded the following species from northern Siam :—

P. polita (Deshayes)	*P. gracilis* (Lea).
P. conica (Gray)	*P. dalyi* Blanford.

To these must be added the race described by Nevill long previously as *Ampullaria turbinis* var., *subampullacea*, and also a second variety of the same species (*lacustris*) to be described here, a hitherto unknown species for which I propose the name *P. angelica*, and, finally, the Cambodian species *P. begini* (Morlet). I regard *P. dalyi* as a variety of *P. turbinis*. The following list of species, varieties and localities embodies our present knowledge of the geographical distribution of Siamese forms so far as that kingdom is concerned :—

P. polita. Bangkok & Chengmai (*Fisch. & Dautz.*) ; ? Upper Menam (*Blanford*).

P. conica. Pitsanuloke ; Lampun (*Blanford*).

P. gracilis. Lampun (*Blanford*).

P. angelica. Bangkok.

P. turbinis. "Siam".

P. turbinis race *dalyi*. N. Siam (*Blanford*); Pitsanuloke.

P. turbinis race *subampullacea*. Singgora and Patalung.

P. turbinis race *lacustris*. Inner region of Inland Sea of Singgora.

P. begini. Lat Bua Kao, Korat.

P. pesmei. Srakao *(Fisch. & Dautz.);* Koh Samesan off C. Liant.

I have examined shells of all these species, and radulae of *P. conica*, *P. angelica*, *P. turbinis* var. *subampullacea*, *P. begini* and *P. pesmei*.

KEY TO THE SIAMESE SPECIES OF PACHYLABRA

I. Shell with $6\frac{1}{2}$ whorls.
 A. Shell of moderate size, of very regular ovoid form, with the mouth projecting very little laterally; the surface highly polished *P. polita.*
 B. Shell large, globose, with mouth projecting abruptly from the body-whorl; the surface not highly polished *P. angelica*

II. Shell with $4\frac{1}{2}$—$5\frac{1}{2}$ whorls.
 A. Shell somewhat elongate, of rather small size, with the upper end of the mouth considerably below the upper margin of the body-whorl.
 i. Mouth of shell more than twice as high as broad; dark spiral bands well developed *P. gracilis.*
 ii. Mouth of shell not more than twice as high as broad; dark spiral bands obsolete or absent *P. conica.*
 B. Shell globose, with the spire little exserted and the upper end of the mouth only a short distance below the upper margin of the body-whorl.
 i. Adult shell at least 70 mm. high, never very thick, without a raised and thickened peristome *P. turbinis.*
 ii. Adult shell between 50 and 60 mm. high, very thick, with a raised and thickened peristome *P. begini.*

iii. Adult shell less than 40 mm. high, moderately thin, without a raised and thickened peristome *P. pesmei.*

This key can be applied only to adult shells and it must be remembered in using it that the shells of *Pachylabra* experience a short period of active growth in the rainy season, in which the peripheral part of their mouth is absorbed and the shell temporarily assumes an immature appearance. For taxonomic purposes shells are best collected towards the end of the wet season or while the animal is in a comatose condition.

Pachylabra polita (Deshayes)

1884. *Ampullaria polita*, Nevill, *Hand List Moll. Ind. Mus.* II, p. 7 (? with var. *compressus*).
1906. *Ampullaria polita*, Dautzenberg & Fischer, *Journ. de Conchyl.* liv. p.426 (? with var. *major*).
1911. *Pachylabra polita*, Kobelt, *op. cit.*, p.82, pl. xxxviii, figs. 1-5.

This is an unusually distinct and well-defined species, readily distinguished from all others by its regularly ovoid outline, in which (in ventral view) the projection of the mouth causes little interruption. The spire is of considerable relative length, occupying about $\frac{1}{3}$ of the total height, and sharply conical in form. The shell is about $1\frac{1}{4}$-$1\frac{1}{3}$ times as high as broad. There are $6\frac{1}{2}$ whorls. The basal whorl of the spire is broad and swollen and the suture both above and below it is deeply impressed. The body-whorl is less globose than in most species. It is irregularly and narrowly cordiform, with the inner outline as seen in dorsal view very oblique and somewhat sinuate towards the anterior extremity, which is bluntly pointed. The suture is not oblique, except, in some shells, just above the body-whorl, where it is apt to change its course in such a way that the depth of the penultimate whorl becomes considerably greater in its outer than in its inner half as seen in dorsal view. The mouth is long and narrow and its main axis forms a very acute angle with that of the shell. It is pointed above and slightly introverted; below it is narrowly rounded. The lip is sharp and the callus not strongly developed. The shell is imperforate or narrowly rimate and the columellar border is slightly expanded over the

umbilicus. The outer lip at the anterior end of the mouth is very slightly expanded.

The external surface of the shell is highly polished and often has a malleated appearance due to relatively large but very shallow depressions arranged roughly in a spiral manner. Numerous minute longitudinal striae can be detected with the aid of a hand-lens.

The external colour is pale olivaceous green, sometimes with a reddish tinge. Spiral bands are absent, but irregular black longitudinal lines sometimes occur. The outer lip is sometimes blackened externally. The interior of the shell is yellowish white and the periphery of the mouth is more or less infuscated.

The operculum is thin, long and narrow, with the posterior extremity pointed and slightly introverted and the anterior extremity narrowly rounded. The outer margin is evenly convex, the inner margin rather deeply concave in its posterior half, nearly straight anteriorly. The external surface is concave as a whole, the internal surface slightly convex. There is a well defined ridge on the inner border of the former, proceeding forwards from a point a little in front of the posterior extremity and gradually growing broader until it reaches a point about two-thirds the distance from the posterior to the anterior extremity. The lines of growth are well-defined and regular and the epidermis thin and polished. The muscular scar on the internal surface is large and its smooth area relatively extensive. The sculpture of the border of the scar is minute and irregular and does not extend outwards over the whole border on the outer edge of the scar. On the inner edge the scar is defined by a prominent ridge. The nacre is of a leaden grey tint.

The following measurements are those, with the exception of the first shell, of specimens assigned by Nevill to his var. *compressa*. I have not the material to decide whether either this variety or Fischer and Dautzenberg's var. *major* is beyond the limits of individual variation.

Measurements (in millimetres) and Proportions of Shells.

Height	75	61	55
Maximum diameter	60	46	41

Height of mouth (oblique) ...	55	41	40
Maximum diameter of mouth ...	27	21	20
Maximum diameter to height ...	1:1.25	1:1.33	1:1.35.
Maximum diameter to heigh tof mouth ...	1:2.03	1:1.95	1:2.
Mouth to height ...	1:1.36	1:1.49	1:1.37.
Max. diam. mouth to max. diam. ...		1:2.19	1:2.05.

These shells are all from Cambodia. Kobelt states that *P. polita* is the characteristic form of that country and of Cochin China. It is probably less common in Siam than the forms of *P. turbinis*, but has been recorded from Bangkok and Chiengmai.

Pachylabra conica (Gray).

1911. *Pachylabra conica*, Kobelt, *op. cit.*, p. 93, pl.xl, figs.1-5, 8. 9.

In some respects the shell of this species resembles that of *P. polita*, but it is usually smaller and never has the same regular ovoid shape, highly polished surface or finished appearance. The mouth projects abruptly in ventral view and the whorls are more tumid, the suture more regularly oblique. The sculpture of the surface is also different, the longitudinal striae being much coarser and more irregular, fine longitudinal ridges being often present on the body-whorl and spiral, minutely interrupted lines also occurring in large numbers. The mouth is as a rule broader and more oblique and the spire blunter.

The colour is dull olivaceous green or brown, occasionally with irregular longitudinal dark lines and usually with obsolete brownish spiral bands. The lip is very narrowly, if at all, blackened. The interior of the shell is ornamented with fairly conspicuous brownish spiral bands, which sometimes extend to the periphery of the lip, which is sometimes white.

The operculum is relatively broader and shorter than that of *P. polita*, with a rather more regular ovoid outline. The inner border of the muscular scar is sometimes rather deeply sculptured in a concentric manner, as is shown in Kobelt's figure, but this is not a constant character.

The radula closely resembles that of other species of

Pachylabra, a genus in which specific differences are not strongly marked in the teeth. Each transverse row consists of seven teeth, two marginals and one lateral on each side of an unpaired central, giving the dental formula 2. 1. 1. 1. 2. The central is transverse and about twice as broad as high. It bears at either side of its base a fairy prominent almost vertical fold and its free margin is armed with five denticulations, all of which are sharply pointed, while the central denticulation is much larger than the others and extends downwards nearly to the base of the tooth. The lateral is comparatively stout, and its free margin resembles that of the central. The marginals have their inner margin distinctly S-shaped. They each bear three long, pointed denticulations, which in the outermost tooth are subequal. The teeth are all comparatively small.

Measurements (in millimetres) and Proportions of Shells.

Height	...	24	41	41	35	35	32
Maximum diameter	...	35	34	34	30	28	30
Height of mouth	...	30	30	27	24	23	25
Maximum diameter of mouth	...	17	15	17	14	14	14
Maximum diameter to height	...	1 : 1.2	1 : 1.2	1 : 1.2	1 : 1.17	1 : 1.25	1 : 1.07
Mouth to height	...	1 : 1.2	1 : 1.37	1 : 1.51	1 : 1.46	1 : 1.56	1 : 1.28
Maximum diameter to height of mouth	...	1 : 1.76	1 : 2	1 : 1.59	1 : 1.71	1 : 1.64	1 : 1.64
Maximum diameter of mouth to that of shell	...	1 : 2.05	1 : 2 : 44	1 : 2	1 : 2.14	1 : 2	1 : 2.28

The average proportion of maximum diameter to height of shell is, therefore, in this series 1 : 1.18, or considerably more than $\frac{1}{2}$; the average proportion of the height of the mouth to the height of the shell 1 : 1.43; that of the maximum diameter of the mouth to its height 1 : 1.72, considerably more than one half; that of the width of the mouth to the total width slightly less than half.

The series of shells of which these measurements are given is from Akyab in Arakan. The species is the dominant one in Lower

Burma and its range extends to China. Blanford records it from Pitsanuloke.

Pachylabra gracilis (Lea).

1856. *Ampullaria gracilis*, (Lea), *Proc. Ac. Nat. Sci. Philadelphia*, VII, p.110.

? date. *Ampullaria gracilis, id., Obs. Genus Unio, etc.* XI, *p.70*, pl. xxii, fig. 1.

Lea's figure and descriptions are probably based on a young shell, and the only specimen I have seen also seems young. The adult shell may be identical with one of those figured by Kobelt (*op. cit.*, pl. xxxvii, fig. 4) as shells of *P. dalyi;* but this figure certainly does not represent either that race or any other of *P. turbinis.* The specimen I have examined resembles a young shell of *P. conica,* but is longer in proportion, with a longer and narrower mouth, a more exserted spire, a more even surface and more conspicuous external spiral bands. The lip is also more sinuous and more produced at the anterior end. The sculpture consists of fine longitudinal ridges with obsolete longitudinal and spiral striae.

The following are the measurements and proportions of this shell:— height 35, maximum diameter 29, height of mouth 25, maximum diameter of mouth 11 mm. Proportion of maximum diameter to height of shell 1 : 1.2, height of mouth to that of shell 1 : 1.4, maximum diameter to height of mouth 1 : 2.26, maximum diameter of mouth to that of shell 1:2.63.

This shell is labelled "Siam" and the species was described without any more precise locality. Blanford records it from Lampun in the northern part of the Kingdom.

Pachylabra angelica, sp. nov.

The shell is large, of moderate thickness and in shape intermediate between *P. polita* (Desh.) and *P. turbinis* (Lea); it is much more globose than the former but has a whorl more than the latter, than which also it is slightly more elongate. Its total height is a little greater than its maximum diameter. There are 6½ whorls, and the spire, though almost acuminate, has a globose appearance towards the base, with somewhat swollen whorls. The extent to

which it is exserted differs in different individuals, but it is never so long as that of *P. polita* or *P. conica*, or so short as that of most forms of *P. turbinis*. The upper surface of all the whorls is slightly, obliquely flattened, but they are never angulate or carinate. The suture is impressed. The body-whorl is broad but oblique. The mouth of the shell is large and a little less than twice as high as broad, but the upper extremity is separated from the upper marggin of the body-whorl by a distance considerably greater than the height of the spire. The main axis of the mouth forms an acute angle with that of the shell. The peristome is continuous and the callus well developed, but not prominent, in complete shells. The upper extremity of the lip is thickened at its junction with the shell and there is a rather broad thickened ridge just inside its outer margin, which is itself sharp. The lower or anterior margin is very little expanded or everted. The shell is narrowly umbilicate and the expanded callus is reflected over the umbilicus.

The external surface is not strongly polished. It is sculptured with numerous fine, low, close-set longitudinal ridges, some of which (set apart at fairly regular intervals) have a broader and flatter appearance than the others. The ridges are crossed by still more numerous minute, decussate or guttate spiral striae, and the surface has a distinctly sculptured look to the naked eye, at any rate on the body-whorl.

The external colour is uniform olivaceous, in some shells with a rather pale greenish and in others with a dark almost purplish tint. The internal surface is greenish white in pale shells and the periphery is faintly stained with pale yellow, the lip being sometimes very narrowly bordered with black. Darker shells are deep purple internally, with a faint indication of spiral bands, which are probably quite visible in young shells. Adult shells of this type have a broad white border to the lip and columella.

The operculum is thick and heavy. Its outline is irregularly pyriform, the external margin being strongly convex and the upper part of the inner margin deeply concave. The posterior extremity is bluntly pointed. The external surface is irregularly concave as a whole, and has the growth lines delicate but distinct. The



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SIAMESE AMPULLARIIDÆ.

EXPLANATION OF PLATE II.

Radular teeth of Siamese species of *Pachylabra* all x 75.

Fig. 1. *Pachylabra pesmei* (Morlet).

Fig. 2. *Pachylabra conica* (Gray).

Fig. 3. *Pachylabra begini* (Morlet).

Fig. 4. *Pachylabra turbinis* var. *subampullacea* (Nevill).

Fig. 5. *Pachylabra angelica*, sp. nov.

Fig. 6. Living animal of *P. angelica* as seen from below. e = eye; e' = eye-stalk; f = foot; m = mouth; o = operculum; t. = tentacle; t' = oral process; s. = siphon;

epidermis is moderately thick and not highly polished; it is of a deep brownish colour. The nacre is livid greyish stained with pink. The muscular scar is large. Its smooth area is long, narrow and prominent. The sculptured border is broad and shallow except at the outer anterior extremity, where there is a distinct pit. The sculpture of this border is obscure and shallow.

The exposed parts of the animal are of an almost uniform sooty black colour. The foot is large, narrowly cordate and bluntly pointed behind. The tentacles are long and slender and the oral processes taper distinctly to their extremity, which is filiform. The siphon is short and broad.

The jaws are stout and strongly chitinized; each has a single projection on its free edge. The radular teeth are also strongly chitinized. They have the usual formula (2. 1. 1. 1. 2.) and closely resemble those of *P. conica* except that they are larger and stouter, with broader denticulations. The central is $2\frac{1}{2}$ times as broad as high, and the latero-basal folds on its disk are very poorly developed. The distal part of the marginals is longer and stouter, and the outer denticulations of the outermost tooth is much smaller than the middle one. The most noteworthy radular character is the large size of the teeth.

Measurements (in millimetres) and Proportions of Shells.

Height	75	73	65
Maximum diameter	65	66	60
Height of mouth (oblique)	58	55	51
Maximum diameter of mouth	31	31	27
Maximum diameter to height	1:1.15	1:1.1	1:108
Maximum diameter to height of mouth	1:1.87	1:1.77	1:1.9
Mouth to total height	1:1.29	1:1.32	1:1.27
Max. diam. mouth to total max. diam.	1:2.09	1:2.12	1:2.22

The width of the shell is thus slightly less than the height,

and that of the mouth a trifle more than $\frac{1}{2}$ of its length; the height of the mouth a little less than $\frac{5}{6}$ that of the shell, and the width of the mouth just less than half of that of the shell.

Type-specimens. No. M. $\frac{11649}{2}$ *Z. S. I.* (*Ind. Mus.*)

This species is apparently the common one in the rice-fields round Bangkok. Dr. Malcolm Smith sent me several individuals found active in ponds in July. They arrived in Calcutta by post from Bangkok with the shell tightly closed by the operculum. They were placed in a dish of water and after about an hour the operculum gradually opened. The animal, however, remained very sluggish for the rest of the day and did not begin to feed until next morning. When they arrived the lung was evidently full of air as they floated in water. Dr. Smith tells me that the eggs are conspicuous in the rice-fields in the winter months.

I am indebted to Dr. Baini Prashad for the following particulars of the anatomy:—

"The animal of this species is on the whole of a much more massive type than of the common *P. globosa* of Bengal. The following anatomical points are interesting from a comparative point of view.

"Both the cephalic and the true pair of tentacles are long, when fully extended the true tentacles are at least two and a half times as long as the cephalic ones. Both pairs of tentacles are fairy thick at the base but taper to a point very gradually. The eye-stalks are small and thick. Both the nuchal lobes are well developed. The right lobe, though not forming an actual siphon as in *Vivipara*, forms a fairy deep groove. The left, or the respiratory siphon of the family, forms a comparatively broad and thick respiratory tube, slightly different in size and proportions from that of *P. globosa* but much more so when compared with that of *Ampullaria insularum* d'Orbigny, as figured by Fischer and Bouvier. [1] The margin of the mantle is very thick. The osphradium is large, and owing to the large development of tissue at its base may be described as pedunculate. The lung is a copious structure with a

1 *Journ. de Conchyl.* XL, pl. iii, fig. 15.

large broad opening. The lamellae of the gills also are well developed leaf-like structures. The ridge separating the branchial from the lung portion of the respiratory cavity is particularly thick in its anterior portion. The rectum is a very thick tube and the opening of the anus is large. The sacs for the copulatory organs are well developed.

"The buccal mass is a massive structure with well developed salivary glands lying just posterior to it; the glands of the two sides are unequal, that of the right side is larger than that of the left, and is placed a little in front of it. The mouth is a large vertical opening with thick lips on its two sides. The jaws are large with a single cutting tooth developed on each. The radula and the cartilaginous flaps on its sides are both brownish in colour. The stomach has a small caecum.

"There is nothing special to note regarding the vascular and the excretory systems. The ovary is large and cut up into a number of lobes. The albumen gland also is a large structure. The male organs are similar to those of *P. globosa*,"

Pachylabra turbinis (Lea).

1856. *Ampullaria turbinis*, Lea, *Proc. Ac. Nat. Sci. Philadelphia* VII, p. 110.
1860. *Ampullaria celebensis*, v. Martens (*nec* Quoy & Gaimard), *Proc. Zool. Soc. London*, p. 12.
1863. *Ampullaria turbinis*, Morelet, *Ser. Conchyl.* III, p. 288.
? date *Ampullaria turbinis*, Lea, *Obs. Genus Unio*, etc., XI, p.70, pl. xxii, fig. 2.
1884. *Ampullaria turbinis* and var. *subglobosa*, Nevill, *Hand List Moll. Ind. Mus.* II, p. 6.
1904. *Ampullaria turbinis*, Fischer & Dautzenberg, *Et. div. Miss. Pavie Indo-Chine* III, p. 425.
1905. *Ampullaria turbinis* and var. *erythrocheila*, Dautzenberg & Fischer, *Journ. de Conchyl.* LIII, p. 427.
1911. *Pachylabra turbinis*, Kobelt (in part), *op. cit.*, *supra*, p.78, pl.xxxvii, fig. 3.

Lea's English description of the species, which seems to be the dominant one in Siam, is as follows:—

"Shell turbinate, yellowish green, transversely banded, rather thick, scarcely perforate, smooth; spire very much depressed: sutures slightly impressed; whorls about five, very convex;

aperture very large, elongately ovate, brownish and much banded within; outer lip acute; columella very much incurved and thickened".

"Diam. 2.36, Length 2.46 inches".

Several local races are found in different parts of Siam and the adjacent countries and it is improbable that all the references given above refer to the *forma typica*. It will be well, therefore, to give a new description of this form.

The shell is large, globose, of moderate thickness. There are 4½ whorls but the apex is often eaten away. The total height is the same as, or practically the same as, the maximum diameter. The spire is depressed and flattened at the base. It projects very little, but is somewhat variable in its exact proportions. The upper surface of all the whorls is slightly flattened, but they are never angulate or carinate. The suture is moderately impressed. The body-whorl is very broad and not very oblique. The mouth of the shell is large and nearly or quite twice as high as broad. Its upper extremity is separated from that of the body-whorl by a distance distinctly greater than the length of the spire. The umbilicus is very narrow and is more or less completely concealed by the expanded columellar callus. In shells that have finished their growth-period the callus is well developed and thick but not prominent. There is a low, narrow rather indistinct thickening of the shell inside the lip, which is sharp. This thickening is most strongly developed in the upper angle. The lower extremity of the mouth is very little everted.

The surface of the shell has a smooth and polished but not brilliant appearance. The sculpture is much like that of *P. angelica* but more irregular and with the thicker longitudinal ridges coarser and the transverse striae less well developed.

The colouration of the shell is variable. Young specimens are spirally banded and the bands may persist to some extent in the adult or subadult. One of the shells assigned by Nevill to his var. *subglobosa* has traces of them. In fully adult shells there are narrow longitudinal dark lines, sometimes set at very regular intervals.

Measurements (in millimetres) and Proportions of Shells.

Height	70	66	61
Maximum diameter	70	65	57
Height of mouth	57	54	51
Maximum diameter of mouth	31	27	26
Maximum diameter to height	1 : 1	1 : 1	1 : 1.07
Maximum diameter to height of mouth	1 : 1.84	1 : 2	1 : 1.96
Mouth to height	1 : 1.22	1 : 1.22	1 : 1. 2
Max. diam. of mouth to maximum diameter	1 : 2.22	1 : 2.41	1 : 2.19

The height and the maximum diameter of the shell are thus practically the same, the mouth nearly twice as high as broad and rather more than $\frac{4}{5}$ as high as the whole shell, which is from $2\frac{1}{5}$ to $2\frac{2}{5}$ as broad as it is high.

There is no information available as to the precise habitat of this race. Lea merely says "Siam," and Nevill's specimens, with one exception, appear to have been originally labelled "Java", but he was probably right in believing that they were of Siamese origin. There is a young shell from Cambodia in the collection of the Indian Museum, but whether it belongs to this race is uncertain. It is considerably broader in proportion than young shells of the race *subampullacea*.

Race dalyi (Blanford).

1902. *Ampullaria dalyi*, Blanford, *Proc. Malac. Soc. London*, V, p. 281, pl. viii, fig. 1.
1911. *Pachylabra dalyi*, Kobelt (in part), *op. cit.*, *supra*, p.80, pl. xxxix, fig 1.
1911. *Pachylabra turbinis*, *id.*, *ibid.*, pl. xxxvii, figs.1,2.

I think that Blanford was right in suggesting that this was only a race of *P. turbinis*. The shell is distinguished by its coarser, thicker, still more globose character and larger maximum size. The upper part of the mouth projects less in ventral view, but its maximum diameter is greater, and the base of the body-whorl is channelled just below the body-whorl. The shape of the spire varies considerably. In some specimens it is considerably more

globose than in the *forma typica*, but in others it is not so, while in one shell it is actually depressed as a whole and its suture is deeply and broadly canalized.

The surface of the shell is dull and the sculpture is coarser and at the same time more regular than that of the typical *P. turbinis*, though similar in general character.

The colour is olivaceous brown externally with fairly regular curved longitudinal dark lines. The interior of the shell is uniform white in the specimens I have examined, but these are all "dead".

The operculum is thick and heavy in these specimens and incrassated somewhat at the two extremities. The scar is large and its smooth area extensive; the sculptured border of fairly uniform width, rather shallow and irregularly and by no means deeply sculptured.

Measurements (in millimetres) and Proportions of Shells.			
Height	89	74	67
Maximum diameter ...	81	62	63
Height of mouth ...	62	55	52
Maximum diameter of mouth...	38	31	28
Maximum diameter to height...	1 : 1.1	1 : 1.19	1 : 1.06
Maximum diameter to height of mouth	1 : 1.63	1 : 1.77	1 : 1.86
Height of mouth to height ...	1 : 1.46	1 : 1.34	1 : 1.29
Maximum diameter of mouth to maximum diameter ...	1 : 2.13	1 : 2	1 : 2.25

This race was described from Northern Siam. The series I have examined is from Pitsanuloke.

Race subampullacea Nevill.

1884. *Ampullaria turbinis* var. *subampullacea*, Nevill, *op cit.*, *supra*, p. 6.

1891. *Ampullaria turbinis* var. *subampullacea*, Möllendorf, *Proc. Zoo. Soc. London*, p. 346.

This race has the shell higher and less transverse, with the mouth higher narrower and more oblique, and the spire more prominent and pointed than the typical form. There are 5½ whorls. The shell is not so thick and globose as in the race *dalyi* but rather

thicker than that of the *forma typica*. The spiral bands are less obsolete, especially on the internal surface, than in either, the lip is paler in colour than in the latter and there is a more definite thickening just inside its margin.

The operculm is rather thin and the smooth area of the scar is relatively large.

The radula is normal. The teeth are large. The central tooth is rather more than $2\frac{1}{2}$ times as broad as high. Its lower angles are produced and sharp, the folds on its disk triangular and prominent; the central denticulation does not reach the base of the tooth and has only two well-developed smaller denticulations on each side. The other teeth are broad at the base. The lateral has the central denticulation as broad at the base as long and two small denticulations at either side, The denticulations of the marginals are long, sharp and unequal.

Measurements (in millimetres) and Proportions of Shells.

Height	76	73	81	73
Maximum diameter ...	70	70	77	70
Height of mouth ...	61	58	64	61
Maximum diameter of mouth	30	30	31	31
Maximum diameter to height	1 : 1.08	1 : 1.04	1 : 1.05	1 : 1.04
Maximum diameter to height of mouth	1 : 2.03	1 : 1.93	1 : 2.06	1 : 1.97
Mouth to height ...	1 : 1.24	1 : 1.26	1 : 1.26	1 : 1.2
Maximum diameter of mouth to maximum diameter ...	1 : 2.33	1 : 2.33	1 : 2.61	1 : 2.35

The height is thus slightly greater than the maximum diameter, the height of the mouth about twice its maximum diameter. The height of the shell is about $1\frac{1}{4}$ the height of the mouth and its maximum diameter $1\frac{1}{3}$ to a little over $1\frac{1}{2}$ the maximum diameter of the mouth.

Type-specimen. No. 2427 M *(Z. S. I.)*.

This is evidently the Malayan race of the species, but its range extends northwards into Peninsular Siam. It was originally described from Perak, is stated by Möllendorf to be common in the Malay

Peninsula, and is the form found in ponds and sluggish streams in the province of Singgora.

The eggs are laid about Christmas or the beginning of the year, as soon as the rains cease. They are exposed some feet above the surface of the water on tree-trunks, posts or the stems of reeds, and are formed into oval masses about the size of a small hen's egg. As they are of a pure white colour they are very conspicuous. The individual eggs are about 6 mm. in diameter but are pressed so closely together that they are usually distorted. Only those in the centre of the mass are fertile or contain yolk, those that cover it externally being reduced to dry scale-like bodies, which protect the true eggs. The scale-like aborted eggs are absent from the base of the mass where it is in contact with the surface to which it is attached. In spite of the protection thus afforded, the fertile eggs are sometimes parasitized by a small wasp. The var. *lacustris* has the same habits of oviposition and often attaches its egg-masses to limestone cliffs. Whether other Siamese species or varieties produce egg-masses of the same type I do not know. In the common Indian *P. globosa* and *P. carinata* the eggs are laid in a shallow depression in damp ground at the edge of water. They form a feebly coherent mass and are all normally constituted and of a spherical shape. In Bengal the eggs are laid after the rains break, about July; but in Madras I have found them rather later in the year.

Race **lacustris**, nov.

I propose this name for a form found at the edge of the inner or freshwater region of the Tale Sap or Inland Sea of Singgora. The spire is still smaller (and flat at the apex) and the body-whorl still broader and more oblique than in shells of the var. *subampullacea* from the same district. The surface is also more irregular and more frequently eaten away. The colour of the shell is also as a rule darker and rougher, but this may be due to the more frequent growth of minute algae on the surface.

Measurements (in millimetres) and Proportions of Shells.

Height	...	78	75	67

Maximum diameter ...	74	73	65
Height of mouth ...	64	65	57
Maximum diameter of mouth	32	32	30
Maximum diameter to height	1 : 1.04	1 : 1.03	1 : 1.03
Maximum diameter to height of mouth	1 : 2	1 : 2	1 : 19
Mouth to height ...	1 : 1.22	1 : 1.12	1 : 1.17
Max. diam. of mouth to max. diam.	1 : 2.31	1 : 2.28	1 : 27

By actual measurement, therefore, the shell does not differ materially from that of the var. *subampullacea*, but it is outlines rather than actual measurements that are of importance.

Type-specimen No. $\frac{11571}{2}$ M. *(Z.S.I.)*

Pachylabra begini (Morlet).

1889. *Ampullaria begini*, Morlet, *Journ. de Conchyl.* XXXVII, p. 184, pl. viii, fig. 1.
1901. *Ampullaria begini*, Pilsbry, *Proc. Ac. Nat. Sci. Philadelphia*, III, p. 189.
1904 *Ampullaria begini*, Morlet, *Et. div Miss. Pavie Indo-Chine*, III, p. 369, pl. xx, fig. 2.
1911. *Pachylabra begini*, Kobelt, *op. cit., supra*, p. 87, pl. xxxv, fig. 4.

Though closely allied to *P. turbinis*, this species is smaller, has a thicker shell and is readily distinguished by the structure of its mouth. The umbilicus is also more open. The peculiarity of the mouth of the shell is due to the great development and prominent character of the peristome produced by the thickening and prominence of the columellar callus and border and the thickening of the lip just inside its margin. The lip is somewhat produced and everted at its lower extermity.

The surface of the shell is rather coarsely sculptured, but varies in this respect. In old shells it has, even to the naked eye, a reticulate appearance, at any rate on the body-whorl, owing to the intersection of blunt longitudinal and spiral ridges. The latter are particularly well developed. Minute spiral striae also occur, but are often hard to detect. The shell seems to be peculiarly liable to erosion both of the spire and of the body-whorl.

The colour varies. In one fresh shell from the Korat district

it is pale fulvous with a pinkish tinge and blotched with white; but this shell appears to be diseased, though the animal in it seems to have been quite healthy. Morlet's description gives the colour as greenish yellow with several obscure spiral bands; the mouth of a brownish tint with several bands inside, the columellar margin yellowish. Most of the shells I have seen are blackish or olivaceous brown, sometimes with indistinct darker spiral bands. These shells have the peristome reddish and the interior of a dull purple tint.

The operculum is moderately thick and is less asymmetrical than that of some speceis. The posterior extremity is blunt. Both extremities are somewhat thickened. The external surface is only slightly concave. The smooth area of the scar is narrow and the sculptured border broad and shallow, except at the anterior extremity, where it is rather deeply hollowed. The sculpture is obscure and irregular.

The radula is characterized by the breadth of the larger denticulations of the teeth. The central is three times as broad as deep and its central denticulation does not quite reach its base. The latero-basal folds are well-developed, narrow and pointed, the lateral denticulations ill-defined. In the lateral tooth only one lateral denticulation can be distinguished on each side, while in the marginals the outer denticulation is relatively small.

Measurements (in millemetres) and Proportions of Shells.

Height	48	45	41	30
Maximum diameter	50	40	36	27
Height of mouth	35	33	32	23
Maximum diameter of mouth ...	20	18.5	16	12.5
Maximum diameter to height ...	1 : 0.96	1 : 1.12	1 : 1.14	1 : 1.11
Maximum diameter to height of mouth	1 : 1.75	1 : 1.8	1 : 2	1 : 2.16
Mouth to height	1 : 1.37	1 : 1.36	1 : 1.28	1 : 1.3
Maximum diameter of mouth to maximum diameter ...	1 : 2.5	1 : 2.16	1 : 2.25	1 : 2.16

The shell is a little higher than broad and its mouth is

from $1\frac{3}{4}$ to twice as high as broad. The total height is from $1\frac{1}{4}$ to $1\frac{2}{5}$ that of the mouth and the maximum diameter is about twice that of the mouth.

The species is said to be common on the lower Mekong and in Cambodia. Mr. Boden Kloss found it abundant in rice-fields at Lat Bua Kao near Korat.

Pachylabra pesmei (Morlet).

1889. *Ampullaria pesmei*, Morlet, *op. cit*, p.185 pl. viii, fig.2.
1904. *Ampullaria pesmei*, *id.*, *op. cit.*, p.369, pl. xx, fig. 12.
1911. *Pachylabra pesmei*, Kobelt, *op. cit.*, p.88, pl. xxxv, fig. 8.

P. pesmei is one of the smallest species in the genus. It has a thinner shell than *P. begini*, to which it is closely related, and the peristome, though complete, has not the same prominent character. The umbilicus also is much narrower. The colour of the shell varies. In Morlet's type it had a curious bluish pink tinge. In the shells I have seen it is rather pale olivaceous brown with or without rather faint spiral bands externally. The interior of the shell is yellowish with a tinge of purple and marked with dark purple spiral bands, which are sometimes confluent and become more conspicuous on the interior of the lip. The peristome is yellowish. The external surface has a rather high polish and the sculpture resembles that of the shell of *P. begini* but is finer.

The operculum is thinner and more pointed posteriorly than that of *P. begini*, and the sculpture of the border of the scar has on the inner margin of the smooth area a concentric arrangement.

The radular teeth are relatively large. The central is more than three times as broad as high and the cusps of all the teeth are narrower in proportion than in *P. begini*.

Measurements (in millimetres) and Proportions of shells.

Height	32	30	31	32	31
Maximum diameter	30	27	28	29	28
Height of mouth	24	21	23.5	23	23
Maximum diameter of mouth	15	12	11	13	12

Maximum diameter to height	1 : 1.07	1 : 1.11	1 : 1.11	1 : 1.1	1 : 1.11
Maximum diameter to height of mouth	1 : 1.6	1 : 1.75	2.14	1 : 1.77	1 : 1.91
Mouth to height	1 : 1.33	1 : 1.43	1 : 1.32	1 : 1.38	1 : 1.39
Maximum diameter of mouth to maximum diameter	1 : 2	1 : 2.25	1 : 2.54	1 : 2.23	1 : 2.33

The shell is slightly higher than broad and the mouth is from $1\frac{4}{5}$ to twice as high as broad. The total height is about $1\frac{2}{5}$ that of the mouth and the maximum diameter of the shell is from twice to $2\frac{1}{2}$ times that of the mouth.

The species was described from Pnom-Penh in Cambodia. I have examined specimens (collected by Mr. Boden Kloss) from the island of Koh Samesan off Cape Liant in the Gulf of Siam.

NOTES ON A COLLECTION OF BIRD-SKINS FORMED BY MR. E. G. HERBERT, C. M. Z. S., M. B. O. U.

By E. C. Stuart Baker, F.L.S., F.Z.S., C.F.A.O.U., M.B.O.U.

(Continued from page 443, Vol. III*).*

The present part concludes the catalogue of Mr. Herbert's collection of birds. The number of species and sub-species enumerated is 295 and of these 11 are new forms, whilst many others have been now recorded for the first time from Siam.

The forms described as new are:—*Eupetes macrocercus griseiventris; Pomatorhinus olivaceus siamensis*; *P. nuchalis klossi; Stachyridopsis rufifrons obscura*; *Cyanoderma erythropterum sordida; Dicrurus leucophaeus disturbans; Prinia inornata herberti; Graucalus macei siamensis; Cyornis magnirostris coerulifrons; Thereiceryx lineatus intermedius; Alcedo meninting scintillans.*

In addition to the above I have also found it necessary to describe many new forms from other parts of the Oriental Region, whilst comparing various series in comparison with those contained in this collection.

Unfortunately, as Mr. Herbert has explained in the first part of this catalogue, I have been considerably handicapped by my want of knowledge of the local geography, and have sometimes been led astray by the similarity, or mis-spelling, of names from widely different localities. Such deductions as are wrong on this account – or any other – I propose, if our Editors will kindly allow me, to correct fully in a further note on Mr. Herbert's collection. In this I shall also be able to deal with those points in which Messrs. Robinson and Kloss have been unable to agree with my conclusions.

There are, however, one or two mistakes it may be as well to correct at once.

Alcippe phœocephala davisoni Harington. This is quite a good sub-species. It is true that the markings of the head are of no use as a character in differentiating between *A. p. magnirostris* and *A. p. davisoni*, but the tint of the upper plumage is quite distinct and suffices to distinguish between the two. Since I wrote

the early part of this catalogue I have had more material for comparison, and must therefore alter my original opinion.

Dicrurus annectens siamensis Kloss. The large-billed bird obtained in Tung Song, Peninsular Siam, should have been retained under the name of *Dicrurus annectens annectens*, but was omitted by a slip. This adds another to the total of species and sub-species described.

STRIGIDÆ.

+ 218. Tyto candida.

Strix candida, Tickell, J. A. S. B. vol. II, p. 572 (1833).

♀ Krabin, C. Siam, 2.11.15.

A beautiful specimen in perfect plumage. This will almost certainly prove to be a resident breeding species, and it will be interesting to know when it lays in Siam. In India, Assam and Burma the breeding season varies greatly: in some parts the eggs are only found in December and January, in others during, before, or after the rains, and in some parts in October.

+ 219. Strix seloputo.

Strix seloputo, Horsf., Trans. Linn. Soc. xiii, p. 140 (1821).

♀ Klong Wang Hip, P. Siam, 8.10.15.

+ 220. Strix indrani maingayi.

Syrnium maingayi, Hume, Str. Feath. vi, p. 27.

♀ Tung Song, P. Siam, 24.9.15.

It is with some hesitation that I assign this specimen to the Malayan form, but it seems on the whole to be nearer this than *newarense*.

+ 221. Bubo coromandus klossi.

Bubo coromandus klossi, Robinson, Journ. Fed. Mal. States Mus. iv, p. 246 (1910).

♂ Klong Bang Lai, P. Siam, December, 1915.

+ 222. Otus scops malayanus.

Scops malayanus, Hay, Madr. Journ. Linn. Soc. xiii., pt. 2, p. 147 (1845).

♂ Krabin, C. Siam, 11.11.15.

This beautiful little Scops is, as would be expected, of the Malayan form.

+223. Otus bakkamœna lettia.

Scops lettia, Hodgs., As. Res. xix, p. 176 (1836).

♂ Samray, Bangkok, C. Siam, 6.3.16.

This specimen is a large bird with the bases of the toes feathered as in the Northern Burmese and Himalayan form.

+ 224. Carine brama pulchra.

Athene pulchra, Hume, Str. Feath. i, p. 469 (1873).

2 ♂ Samkok, C. Siam, 22.6.15, and 17.3.16.

♀ Krabin, C. Siam, 5.11.15.

These birds are all quite typical *pulchra*, showing well the special features noted by Hume. There seem to be three fairly well defined races of *Carine brama, i.e.*,

Carine brama brama. Lighter coloured and larger; wing 147-168 mm. Found over the whole of India north of the Deccan; Assam and North Chin Hills.

Carine brama pulchra. Darker and smaller, wing 131-144 mm. Here and there large individuals occur, and there is a specimen in the British Museum from Siam with a wing of 154 mm. and one other from Tounghoo with a wing of no less than 157 mm.

The alleged difference between *brama* and *pulchra* in the spotting of the head appears to be entirely individual and not specific or sub-specific. The tails of the latter are, however, more definitely and more regularly barred than those of the former.

This form inhabits Central and South Burma, the Malay Peninsula (but to what extent south is not yet recorded), Siam, Yunnan, Southern Shan States and ? Cambodia.

Carine brama fryi. Darker and larger. Wing 152-167 mm. (one 141 mm., probably juv.) This bird was described by me in the Bull. B.O.C., ccxlvi, p. 60, 1919. The form is found in practically the whole of South India as far north as the Deccan, and I have seen typical specimens from Mysore, Travancore, Neilgherries, Madras and the Deccan.

+ 225. Glaucidium cuculoides cuculoides.

Athene cuculoides, Vigors, P.Z.S., p. 8 (1830).

♀ Chan Teuk, E. Siam, 15.8.15.

♂ Pak Jong, E. Siam, 17.8.15.

4 ♂ 1 ♀ Maprit, P. Siam, 31.10.15 to 7.1.16.

The wings of these birds are all under 147 mm. (5.8 in.), and do not approach in size the larger Chinese form *whiteleyi*. The colour of the upper parts of the specimens in this series varies greatly, as it does over the whole of its range. Nos. 1 and 2 are extremely rufous, whilst of the Maprit birds one is nearly pure grey (specimen No. 4.11.15), and others again vary between the two extremes.

ACCIPITRES.

† 226. Spizaëtus alboniger.

Nisaëtus alboniger, Blyth, J. A. S. B., xiv, p. 178 (1845).

♂ Tung Song, P. Siam, 23.9.15.

A magnificent specimen of this most beautiful Eagle, whose colour alone assuredly warrants its being placed in a separate genus to the brown eagles of India and Burma to which the name *Spizaëtus* properly applies.

† 227. Spilornis cheela rutherfordi.

Spilornis rutherfordi, Swinhoe, Ibis, p. 85 (1870).

♀ Tong Song, P. Siam, 26.9.15.

This is a very small specimen, and possibly has been wrongly sexed by the native collector, reliable as he seems to have been in practically every other case. The wing measures only 378 mm.

† 228. Butastur indicus.

Falco indicus, Gmel., Syst. Nat. i, p. 264 (1788).

♀ Krabin, C. Siam, 1.11.15.

It is not yet known whether this fine bird breeds in any of the Central Chinese mountains, but in Siam it is only a winter visitor.

† 229. Haliastur indus indus.

Falco indus, Bodd., Tab. Pl. Enl., p. 25 (1783).

♂ Bangkok, 30. 6. 15.

♂ juv. ♂ Sansep, Bangkok, 4. 7. 15.

The ♂ juv. is in quite young plumage, showing no chestnut below, but with the tail and upper tail-coverts more or less suffused with this colour.

Mr. W. L. Sclater, who is working through the Raptores in the British Museum, has very kindly gone with me through the birds of that order represented in this collection. Of *Haliastur indus*, he only admits three races, *indus*, which is found throughout India to Malaya and Siam, *intermedius* from the Islands, and *gerrenera* from further East.

† 230. Milvus govinda govinda.

Milvus govinda, Sykes, P. Z. S., p. 81 (1832).

This bird appears to be a typical *govinda*; it has not a trace of the white patch under the wing, and the wing itself only measures 436 mm.

† 231. Elanus cæruleus.

Falco cæruleus, Hume, Str. Feath. ii, p. 325 (1874).

♂ Sansep, Bangkok, 4. 7. 15.

† 232. Astur badius poliopsis.

Micronisus poliopsis, Hume, Str. Feath. ii, p. 325 (1874).

♀ Krabin, C. Siam, 30.10.15.

† 233. Astur soloensis.

Falco soloensis, Horsf., Trans. Linn. Soc. xiii, p. 137 (1821).

♂ Hup Bon, S. E. Siam, 18.7.15.

† 234. Lophospizias trivirgatus rufitinctus.

Spizaëtus rufitinctus, Mc Clelland, P. Z. S., p. 153 (1839).

♂ juv. Chan Teuk, E. Siam. 9.8.15.

♀ Klong Song, near Petriu, C. Siam. 21. 2. 16.

† 235. Accipiter virgatus affinis.

Accipiter affinis, Hodgs. in Gray's Zool. Misc., p. 81 (1844).

♀ Chan Teuk, E. Siam, 12. 8. 15.

The Sparrow – Hawks from Tenasserim southwards and Siam eastwards run a trifle smaller than the more northern specimens of *affinis*, but can hardly be considered a distinct race. They are resident wherever found and breed throughout their range. Mr. C. Hopwood, of the Burmese Forest Department, has taken several nests, eggs and young.

† 236. Baza lophotes lophotes.

Falco lophotes, Temm. Pl. Col., p. 10 (1824).

♀ Krabin, C. Siam, 12.11.15.

Wing 232. mm. This beautiful hawk is resident wherever found, but moves about locally to a considerable degree. In the non-breeding season it seems to be very gregarious, and small parties may often be found flopping round together with their curious crow-like flight. Occasionally these parties temporarily join forces, and then a dozen or more birds may be seen together

†237. BAZA JERDONI.

Lophastur jerdoni, Blyth, J.A.S.B., xi, p. 464, (1842).

♀ Hup Bon, S. E. Siam, 20.7.15.

♂ Klong Song, near Petriu, C. Siam, 22.2.16.

†238. MICROHIERAX EUTOLMUS.

Hierax eutolmus, Gray, Gen. Birds 1, p. 21 (1844).

♀ Krabin, C. Siam, 2.11.15.

COLUMBÆ.

†239. CROCOPUS PHŒNICOPTERUS ANNAMENSIS.

Crocopus annamensis, Ogilvie-Grant, Bull. B.O.C., xxviii, p. 27 (1909).

4 ♂ Krabin, C. Siam, 28.10.15 to 7.11.15.

These specimens bear out Ogilvie-Grant's diagnosis of *"annamensis"*. Vassal's skins were in a very bad condition, whereas Herbert's specimens are very beautiful, and are therefore easier to determine. They are decidedly darker birds throughout than *viridifrons*, with less green on the foreheads and much darker heads. In the extreme west of Siam the birds are nearer true *viridifrons*, but still sufficiently divisible from it.

†240. TRERON POMPADORA PHAYREI.

Osmotreron phayrei, Blyth, J.A.S.B., xxxi, p. 344 (1862).

♂ Pak Jong, E. Siam, 19.8.15.

Oberholser has recently shown (Smith. Misc. Coll. No. 7, p. 2) that the name *Osmotreron* is antedated by Gloger's name of *Dendrophasa*. I agree, however, with Hartert, who unites *Treron* and *Osmotreron* under the former name, as there seems no good reason for dividing them. The Siam specimen is quite typical.

241. TRERON OLAX.

Columba olax, Temm., Pl. Col. 241, livr. 41 (1823).

3 ♂ ♀ Klong Wang Hip, P. Siam, 3-4.10.15.

These birds seem rather large, the wings varying from 125 in a young bird to 129 mm. in the largest bird, an adult male, but a few other specimens in the British Museum collection from the extreme south are as big.

I can find no differences between specimens from Sumatra, the type locality, and others from Borneo and the mainland.

+ 242. TRERON VERNANS VERNANS.

Columba vernans, Linn., Mant., p. 526 (1771).

♀ Klong Wang Hip, P. Siam, 30. 6. 15.

♂♀ Maprit, P. Siam, 7. 1. 16.

♂ Klong Bang Lai, P. Siam 25. 1. 16,

The type locality for *vernans* is the Philippines (Brisson, Orni. i., p. 143, 1760), but Oberholser has recently described new races from the islands of Niao and Simalur.

+ 243. TRERON CURVIROSTRA CURVIROSTRA.

Columba curvirostra, Gmel., Syst. Nat., i. pt. 2, p. 777 (1788).

2 ♂ ♀ Hup Bon, S. E. Siam, 25-27. 7. 15.

2 ♂ 2 ♀ Pak Jong, 17. 8. 15 to 21. 8. 15.

♂ Krabin, C. Siam, 2. 11. 15.

♂ Hinlap, E. Siam, 7. 12. 15.

Oberholser points out (Smith. Misc. Coll. vol. 60. No. 7, p. 3, 1912) that the oldest name for this green pigeon is undoubtedly *curvirostra*, of Gmelin, which must replace *nepalensis* of Hodgson. He designates the Malay Peninsula—rather a wide designation—as the type locality for the typical race, and creates several new races from various islands. In my "Indian Pigeons and Doves" I had already pointed out that *curvirostra* was the proper specific name for this *Treron* (p. 68), and I there showed that the correct type locality was Sumatra, and this must therefore now stand and not the Malay Peninsula, though I am unable to separate the birds from the two localities.

+ 244. MUSCADIVORA AENEA SYLVATICA.

Columba sylvatica, Tick., J. A. S. B., ii, p. 581 (1833).

2 ♂ Krabin C. Siam, 2-16.11.15.

I have already shown in "Indian Pigeons and Doves" (p. 93) that it is quite impossible to divide the Southern Indian

and Burmese birds into geographical races, and the Siam birds differ in no way from the Burmese.

Some Ornithologists still ignore the possibility of parallel conditions in different areas resulting in the same form of evolution, but the majority now accept this, and the old theory of the impossibility of interrupted areas containing the same sub-species is being gradually discarded. In India, Burma, Siam and the Malay Peninsula we have a horse-shoe shaped area in which we constantly find similar, if not quite the same, order of evolution proceeding as we work south down the two arms.

Thus we often find the Ceylon birds more nearly approximate their representatives in the Malay Peninsula than either of them do their parent race in the extreme north.

The name *Carpophaga* is preoccupied, and the above generic name takes its place.

+ 245. COLUMBA LIVIA INTERMEDIA.

Columba intermedia, Strick., Ann. and Mag. N. H., xiii, p. 39 (1844).

♀ Pak Jong, E. Siam, 17.8.15.

A typical *intermedia* with dark grey lower back.

+ 246. CHALCOPHAPS INDICA INDICA.

Columba indica, Linn., Syst. Nat. i, p. 284 (1766).

♂ ♀ juv. Klong Wang Hip, P. Siam, 6-9.10.15.

♀ Krabin, P. Siam, 13.11.15.

♀ Klong Bang Lai, P. Siam, 24.1.16.

+ 247. STREPTOPELIA SURATENSIS TIGRINA.

Columba tigrina, Temm. and Knip., Pig. i, pl. 43 (1910-11).

2 ♂ 2 ♀ Samkok, C. Siam, 20-22.6.15.

o Klong Wang Hip P. Siam, 5.10.15.

All these specimens are typical *tigrina*.

+ 248. ŒNOPOPELIA TRANQUEBARICA HUMILIS.

Columba humilis, Temm. Pl. Col. 259 (1824).

♂ ♀ Samkok, C. Siam, 30.8.15.

♂ ♀ Krabin, C. Siam, 10.11.15.

+ 249. GEOPELIA STRIATA STRIATA.

Columba striata, Linn. Sys. Nat. i, p. 282 (1766).

3 ♂ Klong Wang Hip, P. Siam, 30.9.15 to 9.10.15.

I have dealt with this little dove at length in "Indian Pigeons and Doves" (pp. 253-255) and see no reason to alter the conclusions I then came to.

GALLINÆ

Family PHASIANIDÆ

+250. POLYPLECTRUM BICALCARATUM CHINQUIS.

Pavo chinquis, Müll., Sup. Linn. Syst. Nat., p 121 (1776).

♂ Klong Bang Lai, P. Siam, 19. 1. 16.

Since writing on this genus in the Journal of the Bombay Natural History Society (vol. xxiv, p. 209), a further study of additional material has convinced me that it is really necessary to divide it into two races which will stand as (1) *P. b. bicalcaratum* for those birds found west of Assam, and (2) *P. b. chinquis* east of the same Province. The Assam birds are intermediate, those from the extreme east and south being nearer *chinquis*, whilst the birds from the western districts of Goalpara, Kamrup and Naogong are practically true *bicalcaratum*.

+251. GALLUS BANKIVA BANKIVA.

Phasianus bankiva, Raff., Trans. Linn Soc. xiii, p. 319 (1882) Sumatra.

3 ♂ 1 ♀ Pak Jong, P. Siam, 18. 8. 15.

♂ ♀ Krabin, C. Siam, 6. 11. 15.

The four birds obtained on the 18th August are all young birds. Ornithologists are gradually coming round to the view that there is nothing to prove that the domestic fowl is the direct descendant of the Indian Jungle-fowl, and that therefore the name *Gallus gallus* cannot properly be applied to it.

+252. GENNÆUS NYCTHEMERUS RIPPONI.

Gennæus ripponi, Sharpe, Bull. B.O.C. xiii. p, 29 (1902).

♂ Muak Lek, E. Siam, 17.1.16.

2 ♂ ♀ Pak Jong, E. Siam, 26-28.2.16.

In a review of this genus in the Journal of the Bombay Natural History Society (vol. xxiii, p. 658), I gave what we then considered to be the range of the various sub-species of Kalij and Silver Pheasants, but since then Silver Pheasants have been found

over a very greatly extended area, especially to the south, and the present specimens add an enormous area to that occupied by *ripponi*.

253. LOPHURA RUFA.

Phasianus rufus, Raff., Trans. Linn. Soc. xiii., p. 321,1882. (Sumatra.)

4 ♂ Klong Bang Lai, P. Siam, 15-30.1.16.

If the birds from Sumatra always differ from those on the mainland in having their flanks chestnut streaked, the latter will have to be called *Lophuro rufa castanea* (Gray), and the Siam birds would also come under this name.

254. LOPHURA DIARDI.

Euplocamus diardi, Bonap., Comp. Rend. xi , iii, p. 415 (1856).

♂ Chan Teuk, E. Siam, 12.8.15.

4 ♂ 4 ♀ et ♀ juv. Pak Jong, E. Siam. 19.8.15, 28-30.10.15. and 20-22.2.16.

♂ Hinlap, E. Siam, 8.12.15.

255. ROLLULUS ROULROUL.

Phasianus roulroul, Scop. del. Flor et Faun. Insub. ii, p. 93 (1786). (Malacca).

♂ Tung Song, P. Siam, 14.9.15,

256. EXCALFACTORIA CHINENSIS CHINENSIS.

Tetrao chinensis, Linn. Syst. Nat. i, p. 277 (1766).

♂ Samkok, C. Siam, 29.8.15.

♂ Klong Bang Lai, P. Siam, 21.1.16.

Birds from Southern Burma and the Malay States agree in being more richly coloured both above and below, and they generally also have a slaty-blue wash on the upper parts, more especially on the wing-coverts and inner secondaries, the latter of which are in many specimens very strongly suffused with this colour. None of the Indian birds, with the exception of one from Lucknow, has any trace of this colour.

The Siam birds are very richly coloured, and approach *E. c. lineata* in this respect.

257. TROPICOPERDIX CHLOROPUS.

Tropicoperdix chloropus, Tick., J.A.S.B. xxviii, p. 453 (1859).

3 ♂ 3 ♀ Pak Jong, E. Siam, 16-21.8.15 and 26.2.16.

+ 258. TROPICOPERDIX CHARLTONI.

Perdix charltonii, Eyton, Ann. and Mag. Nat. Hist. xvi, p. 230 (1845).

3 ♂ 1 ♀ Maprit, P. Siam, 27.12.15 to 8.1.16.

♂ ♀ Klong Bang Lai, P. Siam. 18.1.16.

This very nice series of Eyton's Hill Partridge adds considerably to the range proved to be inhabited by this bird. Hume referred to its having been found in Tenasserim, and Blyth also gave "Tenasserim Mountains" as a portion of its habitat, but these statements have never been quite accepted. Mr. Herbert's acquisitions prove that it is by no means rare even further east.

"Iris brown. Bill, olive, yellow or naples yellow-brown, through olive-green to brown or even black"; in the latter case the specimen is a very fine old male. "Legs sap-green or yellow, naples yellow, gamboge, sienna" (Mr. Herbert's collector).

+ 259. CALOPERDIX OCULEA OCULEA.

Perdix oculea, Temm., Pig. et Gall. iii, pp. 408 & 732 (1815).

6 ♂ 2 ♀ Klong Bang Lai, P. Siam, 14.1.16 to 1.2.16.

A beautiful series of most beautifully made skins. There are two other closely allied races, *sumatrana* from the Island it is named after, and *borneensis* of Ogilvie-Grant, the latter named from a single skin. The Siam birds are, of course, typical *oculea*.

Mr. C. Hopwood and Mr. F. M. D. Mackenzie recently obtained this bird as far north as the head-waters of the Tavoy river.

+ 260. RHIZOTHERA LONGIROSTRIS.

Perdix longirostris, Temm., Pig. et Gall. iii, pp. 323-721 (1815).

♂ Klong Bang Lai, P. Siam, 24. 1. 16.

This occurrence extends the range of this fine partridge considerably to the north, and curiously enough it was obtained much about the same time as another was obtained in Tenasserim by Mr. C. Hopwood.

The specimen obtained by Mr. Herbert's man is very pale below, and more decidedly a pale fulvous on the wing-coverts and inner secondaries than any other specimen in the British Museum. It seems also to be more richly and cleanly marked than any other, but this perhaps is due to the perfection of the make-up of the skin.

261. Francolinus chinensis.

Tetrao chinensis, Osbeck, Voy. China ii, p. 326 (1771).

♂ ♀ Chan Teuk, E. Siam, 11-15 8. 15.

The Burmese and Siam birds, except those in the extreme north of the Chin Hills and Yunnan, average much smaller than those of China. Thus 14 Chinese males average in wing measurement 152 mm. and vary between 145 (1), 149 (1), and 158 mm. The 22 Siamese and Burmese birds average only 142, and vary between 136 and 151 mm. If, however, we leave out the birds of the Chin Hills and Yunnan, which agree better with the Chinese birds in size, the average is reduced to 141 mm., with a maxium of 149 mm., equal only to the smallest but one of the Chinese birds.

A Saigon female is very small, having a wing of only 122 mm., another instance perhaps of specially small races in this area. I can trace no difference in plumage between the Chinese and Burmese birds correlating with that in size.

HEMIPODII

Family Turnicidæ

262. Turnix pugnax plumbipes.

Hemipodius plumbipes, Hodg., Icon. ined. B. M. Nos. 126 & 127: id. Sporting Mag., p. 346 (1837).

♀ Muak Lek, E. Siam, 28.8.15.

This specimen appears to belong to the typical Burmese and Malayan form *plumbipes*, whilst others from the extreme east and the north-east are perhaps referable rather to *T. p. rostrata*, the Chinese form.

GRALLÆ

Family Rallidæ

263. Hypotænidia striata gularis.

Rallus gularis, Horsf. Trans. Linn. Soc. xiii, p. 196 (1822).

2 ♂ Klong Sam, near Bangkok, 13.2.16.

♀ Samkok, C. Siam, 18.3.16.

The wings of all three of these specimens vary between 5 in. and 5.1 in. (126-129 mm.). They are very dark and richly coloured above, and are a pure slaty grey below. As a series, taken

together with those in the British Museum collection, they seem to contrast in this respect with birds from India and Southern China. The difference, however, between birds from north and south and from east and west is so trifling, and so many individuals agree with others from the opposite area that it does not seem advisable to divide them into geographical races.

The Philippine and Celebes birds appear to be habitually darker and more richly coloured both above and below than those from other parts of this Rail's habitat, and can easily be distinguished by this feature.

The Philippines are the type locality for *striata*, so that birds from elsewhere will have to bear the name *gularis* of Horsfield, type locality Java.

Birds from Borneo are intermediate, a little darker than typical *gularis* and perhaps nearer *striata* than the other form.

♱ 264. Amaurornis phœnicura chinensis.

Fulica chinensis, Bodd. Tabl. Pl. Enl., p.54 (1783).

♀ Krabin, C. Siam, 8.11.15.

♂ Klong Bang Lai, P. Siam, 15.1.16.

2 ♂ ♀ Bangkok, 13.2.16 and 10.3.16

♂ Samkok, C. Siam, 18.3.16.

This species was reviewed by E. Streseman in *Novitates Zoologicae* xx, p.303. In this he shows that the typical *phœnicura* is confined to Ceylon and that our Indian aud Burmese birds are the same as the Chinese (type locality, Hong Kong) and must bear the name *sinensis*. True *phœnicura* will probably, however, eventually be found to extend into Southern Travancore, the avifauna of which is strongly Ceylonese.

♱ 265. Gallicrex cinerea.

Fulica cinerea, Gml. Syst. Nat. 1, p.702 (1788).

♂ Samkok, C. Siam, 30.8.15.

This is a young bird which has not yet completely attained adult plumage.

LIMICOLÆ

Family Glareolidæ

266. Glareola pratincola orientalis.

Glareola orientalis, Leach, Trans. Linn. Soc. xiii, p.132 (1821).

♀ Meklong, C. Siam, 27.6.15.

3 ♂ ♀ et ♂ juv. Bangkok, 30.6 to 5.7.15.

♀ juv. Samkok, C. Siam, 29.8.15.

A nice little series of these Pratincoles, or Swallow-Plovers. Two of them are in the spotted juvenile plumage and evidently bred in the vicinity of the place where obtained. They breed in suitable places throughout Burma and Siam. [1]

267. Glareola lactea.

Glareola lactea, Temm. Man. d'Orni. ed. 2e, ii, p.503(1820).

♂ ♀ Krabin, C. Siam, 11.11.15.

Mr. Herbert is apparently the first to obtain specimens of this beautiful little Swallow-Plover in Siam.

Family Parridæ

268. Metopidius indicus.

Parra indica, Lath. Ind. Orn. ii, p.765 (1790).

♂ ♀ Bangkok, 30.6.15.

3 ♂ Krabin, C. Siam, 31.10 and 8.11.15.

269. Hydrophasianus chirurgus.

Tringa chirurgus, Scop. Del. Flor. et Faun. Insubr. ii, p. 92 (1786).

♀ Krabin, C. Siam, 8.11.15.

Family Charadriidæ

270. Sarcogrammus indicus atronuchalis.

Lobivanellus atronuchalis, Blyth, Jerdon B. of Ind. iii, p. 648. (1864).

♂ 2 ♀ Samkok, C. Siam, 19.6. and 30.8.15.

♂ Meklong, C. Siam, 27.6.15.

The two males are in full plumage; the two females have patches of white on the throat and chin, but are otherwise in fully

[1] These birds breed in large numbers in all of the three localities named. E.G.H.

adult plumage. One female also has the white band on the side of the head produced through the ear-coverts almost to the neck, as in *indicus indicus*, but has the typical white back-band of *i. atronuchalis*.

271. CHARADRIUS DUBIUS JERDONI.

Ægialitis jerdoni, Legge, P. Z. S. p. 39. (1880).

♂ Krabin, C. Siam, 3.4.15.

This specimen appears to be true *jerdoni*, and not *dubius dubius* of China.

272. HIMANTOPUS HIMANTOPUS.

Charadrius himantopus, Linn. Syst. Nat. i, p. 255 (1766).

3 ♂ Paklat, near Bangkok, 13.2.16.

Of the three birds one has the whole head and neck pure white, the second has these parts with numerous obsolete black markings, whilst the third has a large black patch on the nape.

This Stilt has lately been discovered breeding in Tennasserim, and very probably will prove to be a resident breeder in Siam also. [1]

Family TOTANIDÆ.

273. TRINGA GLAREOLA.

Tringa glareola, Linn. Syst. Nat. i, p. 149 (1758).

♂ Hua Takhae, C. Siam, 10.2.16.

274. TRINGA OCHROPUS.

Tringa ochropus, Linn. Syst. Nat. i, p. 149 (1758).

♂ ♀ Krabin, C. Siam, 3.11.15.

275. TRINGA NEBULARIA.

Scolopax nebularia, Gunner, Leem, Berkr. Finm. Lapp., p. 251 (1767).

276. EROLIA SUBMINUTA.

Tringa subminuta, Middendorff, Reis. Sibir., Zool. Säugth. Vög. &c. p. 222, pl. 1. xix, Fig. 6 (1851).

♂. Klong Wang Hip, P. Siam, 6.10.15.

[1] Mr. W. J. F. Williamson found it breeding in large numbers, in May 1918, about 22 miles S. S. E. of Bangkok, and took a considerable series of eggs. Eds.

This specimen still has a great deal of the summer rufous on the upper plumage, and the outer rectrices all have broad white edges.

Family Scolopacidæ.

277. Gallinago gallinago.

Scolopax gallinago, Linn. Syst. Nat. i, p. 147 (1758).

This bird has pure white axillaries and very broad white edges to the feathers of the under wing-coverts, the feature by which the supposed eastern form, *G. g. raddei* is divided from the western. This characteristic is, however, so very irregular that it cannot possibly be considered of sub-specific value. Many birds from the extreme East are as dark as any from the extreme West, though it is but rarely that very white under wings are found in western birds.

Family Laridæ.

278. Larus brunneicephalus.

Larus brunneicephalus, Jerdon. Madr. Journ. Linn. Soc. xii, p. 25 (1840).

2 ♀ Paknam, C. Siam, 14.2.16.

Both these birds are in rather abraded plumage with wings of 320.5 and 317.4 mm. respectively, and both also, have remains of juvenile plumage on wings and tails.

Blanford gives Burma as the furthest limit east of this gull's range, so Siam is yet a further extension.

279. Hydrochelidon leucopareia.

Sterna leucopareia, Natt. in Temm. Mam. d'Orni. 2nd ed. ii, p.746 (1820).

2 ♀ Hua Takhae, C. Siam, 10.2.16.

280. Sterna sinensis.

Sterna sinensis, Gml. Syst. Nat. i, p.608 (1788).

2 ♀ Meklong, C. Siam, 27.6.15.

Both these females are in full breeding plumage, and this species is of course a resident breeding bird in Siam.

Family Phalacrocoridæ

281. Phalacrocorax carbo indicus.

Phalacrocorax carbo indicus, Mathews, B. of Aus. iv. pt. 2, p.171 (Feb. 1915).

♀ Singgora, P. Siam, 12.10.15.

Mathews' brief description of his new sub-species merely reads "This form is characterized by its small size and purplish green colouration".

I accept Mathews' name with great hesitation, as I cannot personally divide any of the races of *P. carbo*, as at present diagnosed, from one another. (See Hartert, Novitates Zoolog. xxiii, p. 293, &c.)

282. PHALACROCORAX JAVANICUS.

Carbo javanicus, Horsf. Trans. Linn. Soc. xiii, p. 197 (1821).

♂ ♀ Bangkok, 5.7.15.

The male is in full breeding plumage with white filaments on head and neck, whilst the female is in juvenile plumage, and appears to be a bird about a year old or rather less.

Family CICONIIDÆ.

283. ANASTOMUS OSCITANS.

Ardea oscitans, Bodd. Tabl. Pl. Enl. p. 55 (1783).

♀ Samkok, C. Siam, 20.6.15.

Though it has been recorded from Cochin China I do not think the Open-bill has yet been recorded from Siam. Blanford notes that it is rare in Pegu and unknown elsewhere in Burma.[1]

Family ARDEIDÆ.

284. HERODIAS GARZETTA.

Ardea garzetta, Linn. Syst. Nat. i, p. 237 (1766).

2 ♂ Meklong, C. Siam, 26.6.15.

One male is in full breeding plumage with perfect crest and breast-plumes, and the disintegrated feathers of the back extending beyond the tail. The second bird is still in immature plumage.

285. ARDEOLA GRAYI.

Ardea grayii, Sykes, P.Z.S. p. 158 (1832).

♀ Meklong, C. Siam, 26.6.15.

♂ Bangkok, 30.6.15.

♀ Krabin, C. Siam, 17.11.15.

1. Large flocks of these birds may be seen in suitable localities in C. Siam. *Vide* also Williamson, Vol. III, No. 1, p. 39. E. G. H.

No. 1 is a young bird, No. 2 a male in full breeding plumage, and No. 3 a bird of the year in quite immature plumage with a wing well under 8 in. It might possibly be a young specimen of *bacchus*.

+286. ARDEOLA BACCHUS.

Buphus bacchus, Bonap. Consp. Av. ii, p.127 (1855).

2 ♂ Krabin C. Siam, 4-13.11.15.

♂ Klong Bang Lai, P. Siam, 31.1.16.

A. bacchus and *A. grayi* are, of course, species and not sub-species, and they breed together over a great portion of their joint habitat, *i.e.*, from Assam eastwards, and very often in company on the same clump of bamboos or trees. On account of this young birds are very often hard to determine, and this is the case with the third bird I have named *A. grayi*. but which may possibly be the present species.

+287. BUTORIDES JAVANICA JAVANICA.

Ardea javanica, Horsf. Trans. Linn. Soc. xiii, p.190 (1821).

♂ Krabin, C. Siam, 31.10.14.

♀ Klong Sam, near Bangkok, 12.2.16.

288. NYCTICORAX NYCTICORAX.

Ardea nycticorax, Linn. Syst. Nat. i, p. 235 (1766).

♂ Hua Takhae, C. Siam, 10.2.16.

+289. GORSACHIUS MELANOLOPHUS.

Ardea melanolopha, Raffles, Trans. Linn. Soc. xiii, p. 3 6 (1822).

♂ Maprit, P. Siam, 5.1.16.

This is a heron with a very wide range from Travancore in Southern India, throughout that country wherever suitable, and throughout Burma, Siam and the Malay Peninsula, but nowhere is it at all well known, less because of its rarity than on account of its skulking shy habits. In Assam when beating for buffalo we used sometimes to put this bird up, but in bright sunlight it was as unhappy and uncomfortable as an owl.

+290. ARDETTA CINNAMOMEA.

Ardea cinnamomea, Gml. Syst. Nat. i, p. 643 (1788).

♂ ♀ Krabin, C. Siam, 3-13.11.15.

+ 291. Dupetor flavicollis flavicollis.

Ardea flavicollis, Lath. Ind. Orn. ii, p. 701 (1790).

♂ ♀ Samkok, 31.8.15. and 18.3.16.

+ 292 Botaurus stellaris.

Ardea stellaris, Linn. Syst. Nat. i, p. 239 (1766).

○ Raheng, C. Siam, Feb-March, 1915.

Family Anatidæ.

+ 293. Dendrocycna javanica.

Anas javanica, Horsf. Trans. Linn. Soc. xiii, p. 199 (1821).

♀ Meklong, C. Siam, 27.6.15.

♂ 3 ♀ Klong Wang Hip, P. Siam, 30.9 to 5.10.15.

The three birds killed in October are nestlings still in down.

+ 294 Nettopus coromandelianus.

Anas coromandeliana, Gmel. Syst. Nat. i, p. 522 (1788).

4 ♂ 4 ♀ Krabin, C. Siam, 30.10 to 8.11.15.

Family Podicipedidæ.

+ 295. Podicipes fluviatilis albipennis.

Podiceps albipennis, apud. Blyth Cat. p. 311; Theobald, J.A.S.B. xxiii, p. 603.

♂ juv. Krabin C. Siam, 8.11.15.

ADDENDUM.

Pachylabra winkleyi (Pilsbry).

1901. *Ampullaria Winkleyi*, Pilsbry, *Proc. Ac. Nat. Sci. Philadelphia*, LIII, p. 189, pl.V, figs. 2, 3.

Since I corrected the proofs of this paper I have discovered an interesting specimen from my own Tale Sap collection that had been temporarily mislaid. It agrees very closely, except in being considerably smaller, with Pilsbry's figure of this species, differing from *L. begini* in the well-marked flatness of the whorls outside the suture and in the very fine, minutely granular transverse striae. The external surface is pale olivaceous with occasional, irregular black longitudinal streaks. The inside of the lip is yellowish but the margin white.

It is evident that I was wrong in identifying the form common in the Southern Shan States *(Rec. Ind. Mus.*, XIV, p. 138; 1918*)* with *P. winkleyi*. It can hardly be distinguished from *P. maura* (Reeve), which is certainly not more than an eastern local race of *P. globosa* (Swainson), the species common in the Ganges valley.

P. winkleyi was originally described from Henzada in Pegu and has not hitherto been recorded from Siam.

N. Annandale.

MISCELLANEOUS NOTES.

No. I. Note on Siamese Pheasants

The British Museum has recently received from Mr. K. G. Gairdner four most interesting skins from Siam.

The first of these is a beautiful specimen of *Phasianus humiae burmanicus* from the hills of northern Siam, shot at an elevation of about 6000 feet. This is a great extension of this fine pheasant's hitherto recorded range and adds yet another Game Bird to the Siamese list.

The other three skins are those of *Gennaeus lineatus* and must I think for the present be retained under typical *Gennaeus l. lineatus* until we get further skins to endorse or refute the value of the differences shown by these specimens.

Of the three skins two are those of males, one fine old bird, the other a male just having attained adult plumage; they were both shot on the Me Ping rapids half way between Chiengmai and Raheng; the third, which is a female, was shot near Raheng at a height of 1500 feet.

Raheng is a good long way north and east of the nearest point at which true *lineatus* has yet been found and it is not surprising to find that the skins show some remarkable points not wholly consistent with their being this bird.

The young male might be a typical *lineatus* from Pegu, except that its central tail feathers somewhat approach the more northern forms. The old bird however is very big with a much fuller bigger crest than *lineatus* usually indulges in, and with a tail of no less than 390 mm., which also approaches *sharpei* in general appearance.

The female is like that of *lineatus* but approaching somewhat to that of *rufipes* and not that of *sharpei*, the which, as far as we know at present, has always a dark under-surface with the feathers streaked not barred as in this specimen.

It will be very interesting to obtain more specimens, for it seems as if we might have here a new race combining features of *G. l. lineatus*, *G. l. rufipes* and *G. l. sharpei*.

E. C. Stuart Baker

British Museum, Dec., 14. 1919.

No. II. Notes on Early Snipe.

I am indebted to Mr. E. Chapple for most of the birds upon which the following notes are based.

The first snipe of the season (1919) was shot by Major Forty on the 29th August.

On September 1st. one gun obtained one bird, and another three birds.

September 8th. Birds were still scarce, and Mr. Chapple secured three couple of Pin-tails. All birds were in a heavy state of moult, mostly with the first three primaries old, the fourth and fifth were new stumps, the next two about half-grown and the remainder full new feathers. The primary and greater wing-coverts were in a very ragged state through moult, most of them being missing. Two tails were also in moult, and in some cases the "pins" were in moult too.

September 14th. 24 couple, all Pin-tails. The first quarter of the moon was on the 2nd and full moon on the 10th, so those who base their calculations on the first large influx of birds coming down by the light of the moon can do so from this date, as this was the first good bag of the season. The state of the moult showed very little change from last week; though some birds were more advanced and one had complete new primaries.

September 21st. All Pin-tails, and not much change in the state of moult.

September 28th. All Pin-tails, but the birds appeared to be in rather heavier moult than those shot the two previous weeks, which would seem to show that they were fresh arrivals and that the others had continued their journey south.

October 4th. Three couple of Fan-tails were secured by three guns, and the rest were all Pin-tails. The Fan-tails were in almost complete new plumage, but some of the Pin-tails had three and others five old primaries, showing that they were in the same state of moult as the first arrivals a month earlier.

October 8th. 6 couple of Fan-tails and 8 couple of Pin-tails. There was no change in the moult of either since last week.

October 15th. Two Pin-tails sent in to show the state of their moult. One was an old bird and the other a young one. The old bird had one old primary, two new stumps for the second and third, and the moult of the wings was nearing completion. As regards the tail the upper and lower coverts were in full moult, the four centre feathers of the tail had been changed but the side feathers and the "Pins" were in moult. The young bird had lost the two centre feathers of the tail, otherwise there was practically no sign of moult. There was also a distinct difference in colour as the younger bird lacked the depth of colouring of the old bird.

From the difference in the state of moult and the depth of colouring it seemed that old and young birds could be identified at a glance, but an inspection of more young birds, a few days later, showed that in the majority of cases there was no difference

between the young and the old birds, either as regards the state of moult or depth of colouring.

The young birds were identified by the shorter bill (about 6 to 10 mm. less than the old bird) and by the lack of development of the corrugations on the bill, by brighter colour and smaller size of the legs, and lastly by the sutures on the skull.

Careful note of the first arrival of young birds was not taken, but it is believed that the first obtained was fully a month later than the arrival of the old birds.

October 18th and 19th. Both days yielded the same proportion of seven Pin-tails to two Fan-tails, but this must vary according to the suitability of the ground for the latter birds, as Fan-tails are nearly always found in the paddy. Their softer and more sensitive bills necessitating their feeding in the softer ground.

February 25th 1920.

E. G. Herbert.

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MORE NOTES ON SIAMESE BIRDS.

By C. Boden Kloss, M.B.O.U.

These remarks were intended as an addendum to my "Notes on some recently-described Siamese Birds," but reached the Editors too late for inclusion in Vol. III, No. 4. Since that article was in print (pp. 447-53) I have heard from Mr. Stuart Baker that only those examples of **Otocompsa flaviventris** from Pak Jong and its neighbourhood and from Krabin are red-throated birds; the specimens from Peninsular, SW., W. and SE. Siam are all black-throated (*O. f. minor*).

Mr. W. J. F. Williamson has also, quite lately, sent me material from his collection which throws further light on some of the forms dealt with. His series of bulbuls from SW., N. and SE. Siam are all of the black-throated kind. One bird of several from Sriracha is interesting, as on careful inspection a slight trace of red can be perceived at the base of the throat: thus proving that *johnsoni*, as I pointed out, is only an off-shoot and sub-species of *O. flaviventris*. He has one red-throated bird from Phrabat, between Lopburi and Pak Jong. We shall eventually find, I fancy, that **O. f. johnsoni** only occurs east of the Menam Chao Phya and north of the latitude of Bangkok.

The Southern black-throated bulbul (**O. f. minor**) is of the same size as *johnsoni* with wings not more than 87 mm. long: Mr. Baker writes me that the wings of the typical Northern form

(*O. f. flaviventris*) range between 87 and 94 mm. and that it has a longer crest; the Malayan and Indo-Chinese bird is therefore quite a recognisable subspecies.

Five examples of a Cuckoo-Shrike from Nong Kae, SW. Siam,* belonging to Mr. Williamson, are all **Lalage polioptera**, and a female from Bandon, Peninsular Siam, is either **L. fimbriata neglecta** or intermediate between that race and *L. f. culminata*. Bandon is in a transition zone between the two forms and it is not easy to determine to which a solitary banded specimen should be referred.

A series of ten examples of **Chalcoparia singalensis koratensis** from Bangkok, N., E. and SE. Siam (Sriracha and Satahip), in their more intensely yellow abdomens extending farther upwards and meeting more abruptly the rufous of the throats, beautifully illustrate the difference between themselves and *C. s. singalensis* in which the bellies are duller, while the rufous extends farther down the breast and ends indefinitely.

Mr. Baker writes (Journ. N. H. S. Siam, iii, p. 415) that he has compared 25 Siamese birds with over 100 specimens from more northern countries and can detect no differences of sub-specific value. I have no doubt that this is so and it goes to show that all northern birds are *C. s. koratensis*. Baker has completely misapprehended the gist of the matter: *singalensis* is not of the north but of the south, where Malacca has been selected as its type-locality, and it is because of the differences that exist between East Siamese birds and those of the Malay States that *koratensis* is valid as a good subspecies.

Of course if you compare things which are the same with one another you don't find the differences which are shown by comparison with them of things which are something else: if you compare *koratensis* with *koratensis* you naturally won't see the differences which separate *koratensis* from *singalensis*.

It is more or less as above that Baker arrives at the conclusion (tom. cit., p. 423 and Ibis, 1919, p. 192) that **Chrysophlegma**

*About 50 miles north of Koh Lak.

flavinucha lylei, also, cannot be accepted as a subspecies :—because some woodpeckers sent by Mr. E. G. Herbert from Siam do not differ from examples of *C. f. pierrei,* therefore *lylei,* also from Siam, must be the same as the others and also be *pierrei.* But Mr. Herbert's birds which came from *Eastern* Siam and mine from *South-western* Siam are *not* alike (I have examined Herbert's specimens); the former are indeed *pierrei*—absolutely: but the other is not.

Baker further suggests that birds obtained and recorded from North Siam by Gyldenstolpe as *C. flavinucha* are probably also *pierrei;* but he is probably mistaken. One of the characters distinguishing *pierrei* is its dark bill whereas North Siamese birds have, according to Gyldenstolpe (Kungl. Sv. Vet. Akad. Handl., 56, No. 2, p. 92), bills "bluish grey to white"—as has *lylei!*

Mr. Williamson has also sent for inspection a considerable series of black and grey Drongos from Siam.

During my visit there at the end of 1916 I obtained black birds of two forms and determined one, by comparison with Javanese material, as **Buchanga atra longus:** then, not realising that one or both might be merely visitors and being unwilling to recognise two resident races of the same species occurring together, I forced the second into *Dicrurus annectens* and described it with the name of *siamensis.* I have since realised that it is **Buchanga atra cathoeca** (previously recorded by Gyldenstolpe from Koh Lak, in Kungl. Sv. Vet. Akad. Handl., 56, No. 2, p. 20); but the original description of the race by Swinhoe is misleading as the bronze colour it was said to possess is merely caused by wear.

Since it was impossible to discover any difference between the small series of *longus* from Siam and Java (vide Ibis, 1918, p. 227), it might be thought that there is migration between the two places: but it is an argument against such a practice that the climates of both are very similar and there is in neither any considerable annual variation. Further, though nearly all the examples known to me from Southern Indo-China (North Malay Peninsula, Siam and S. Annam) were taken between October and May, yet Mr.

Williamson has obtained a specimen from Pran, SW. Siam, in June, which seems to indicate that the bird is a true resident. Bartels states that *longus* is in good plumage in Java at the middle of the year and I have found it plentiful from January to April, so we may infer that it is continuously present there. If it migrated we should expect to meet with it at times in the well-explored countries bordering its line of travel, but it is unknown from Sumatra, Borneo or the Malay Peninsula south of Victoria Point, Tenasserim.

The case of *cathoeca* is different; it is not yet correctly recorded from Annam (for *Buchanga atra cathoeca*, Ibis, 1919, p. 610, is *B. a. longus*), but it is known from the other areas mentioned above from November to May only, and it is highly probable that it is merely a winter visitor in Southern Indo-China, to which it comes to escape the cold season of Southern China.

A number of grey drongos from Siam of **Buchanga leucophaea** type are in Mr. Williamson's collection and, with others available, form a fairly large series. On laying out this material by characters it falls into two groups:—(*a*) larger and, on the whole, darker birds: (*b*) paler, smaller specimens; and it is evident that two forms occur.

Fourteen specimens of the larger race measure:—

Wings, 134 to 146; average 140 mm.

Tails, 140 to 168; average 154 mm.

The bills from gape range as long as 28.5 mm.

Most of these specimens, which were collected between October and February, come from Bangkok, but some were obtained as far south as Victoria Point and east as Lat Bua Kao and Koh Chang Id., Chantabun. I regard them as probably belonging to Baker's race **B. l. hopwoodi**, extending from Eastern Bengal to Yunnan (Nov. Zool. xxv, 1918, p. 294) which thus seems to migrate in winter as far south and east as the above localities, but apparently no further. Hume and Davison's specimens of *Buchanga pyrrhops* from Tenasserim are probably the same (Stray Feathers, vi, p. 216).

The remaining birds, smaller and rather paler, measure:—

Wings, 129 to 139; average 132 mm.

Tails, 127 to 155; average 140 mm.

The bills on the whole are a little smaller than the others.

The range of the specimens is from Victoria Point through Siam to South Annam and they were collected between September and May, while Gyldenstolpe secured examples, which seem similar, in North Siam during May, June and July (t. c. s., p. 21).

These birds are apparently **B. l. mouhoti** with which they agree in size, though Walden stated that the Cambodian type of this race was darker than the typical Javanese form. I find that, on the whole, the contrary is the case and so did Gyldenstolpe: however, within narrow limits it appears that much importance cannot be attached to colour, as the tone of the plumage varies with wear and age. (There are among the Siamese series several examples which have the under-wing coverts spotted with white and the vents and under-tail coverts greyish-white, and they are altogether paler than the others: on the other hand some adults in much worn plumage are quite as dark as the darkest of Javanese birds). The distinction between the Javan and continental forms seems to lie in the slightly longer tail of the latter, as a series of thirty-four birds from Java measures:—

Wings, 124 to 139; average 130 mm.

Tails, 123 to 145; average 132 mm.

I see no difference in the bills which measure in both from 26 to 28. 5 mm.*

The fact that, according to Bartels, *B. l. leucophaea* is in best plumage at the end and beginning of the year shows that it does not leave Java at that season and that, apart from smaller size, it is not the same bird as *B. l. mouhoti* which, judging by the dates on which it has been collected and the occurrence of immature indi-

* This series shows a higher range than Baker's, in which the tails measure from 118 to 131, average 123 mm. only (t.c.s., p. 292).

viduals, would appear to be a real resident throughout southern Indo-China.

What is **Bunchanga leucophaea disturbans** (Baker, Nov. Zool. xxv, 1918, p. 293), a small drongo distinctly darker than the Javan *leucophaea*, with a habitat from Amherst (typical locality) down into the Malay Peninsula and found also at Pak Jong, E. Siam ?

Two dark races have already been described from ths, area :—**nigrescens** Oates, from Rangoon ; and **intermedia** Blythi from Penang (not, *fide* Baker, from the extreme south of the Peninsula), with a wing of 127 and tail of 130 mm. in the type.

We have nine examples of the latter which were taken in Kedah and Junk Seylon during November and January and determined by actual comparison with Blyth's type lent by the Indian Museum. They measure :—

Wings, 123 to 134 ; average 128 mm.
Tails 124 to 138 ; average 133 mm.

While the measurements of *disturbans* are :—

Wings 120 to 136 ; average 127 mm.
Tails 122 to 151 ; average 131 mm.

Baker gives the habitat of *nigrescens* (a very dark bird with which, however, he associates pale individuals*) as from about Bhamo to Bangkok, thus establishing an overlap with *disturbans* throughout the country between Amherst and Bangkok. Oates considered Junk Seylon birds to be the same as those of Rangoon and, as shown above, the former are *intermedia* : therefore *nigrescens* (*fide* Oates) can scarcely be a very different bird from the latter.

I have always regarded Oates' birds from Rangoon and the neighbourhood as practically the same as *intermedia*, though possibly a slightly larger race, and there seems hardly room for a third dark bird between Penang and Rangoon, especially when it is

* I am not sufficiently acquainted with northern birds to have a definite opinion, but I question Mr. Baker's allocation of pale birds to *nigrescens*.

based on an individual from a place so near the latter town as is Amherst.

It does not seen probable to me that *intermedia* (*nigrescens*) is a subspecies of *leucophaea* but rather allied to *longicaudata* of the Indian Peninsula, or else a distinct species. I imagine at least two species:—a paler Malaysian bird running from Java up through Indo-China, and a darker Indian one, typified by *longicaudata*, extending through Indo-China down into the Malay Peninsula.

TWO NEW *LEGGADA* MICE FROM SIAM.

BY C. BODEN KLOSS, F. Z. S.

These mice are part of a collection of mammals from Western Siam made by Mr. K. G. Gairdner, about which I have written in previous volumes of this Journal.

Some years ago Mr. G. S. Miller united the genus *Leggada* of Gray with *Mus*[1], and Mr. Oldfield Thomas acquiesced in this opinion. When I first examined Mr. Gairdner's mice it seemed to me that they represented a new genus, for I was unable to find one in which they could be placed: but at about the same time Mr. Thomas, in England, came to the conclusion that *Leggada* was worthy of recognition and decided to revive it[2]. Mr. Thomas, who has since then seen these specimens, writes me that they belong to *Leggada* as he now conceives it, and has kindly sent me an example of *Leggada pahari* from Sikkim[3] to which some of the specimens are closely related.

These animals are like *Mus* with notched incisors, m^1 longer than m^2 and m^3 combined and with no frontal ridges; but without any masseteric knob at the anterior roots of the anteorbital plates and the palatal foramina not narrowing to acute terminations between the molars. The external appearance is apparently similar but the pelage is spiny.

The following Key indicates the differences, as far as Indochinese species are concerned, between some genera of mice which have the bevelled edges of the upper incisors notched.

A. Palatal foramina penetrating deeply between the molars.

a. Frontal ridges well marked: no masseteric knobs. *Leggadilla*.

b. No frontal ridges.

a1 Masseteric knobs present: molar laminae much distorted. *Mus*.

b1 Masseteric knobs absent: molar laminae less distorted. *Tautatus*.

B. Palatal foramina not penetrating deeply between the molars: no frontal ridges nor masseteric knobs. *Leggada*.

1. Miller, Mammals of Western Europe, 1912, p. 863.
2. Thomas, Journ. Bombay Nat. Hist. Soc., xxvi, 1919, pp. 417-420.
3. *Mus pahari*, Thomas, op. cit. xxiv, 1916, p. 415.

Leggada pahari gairdneri subsp. nov.

Diagnosis. A little more buffy above than *L. p. pahari* (Thomas) and whiter below; the tail also paler below, nearly bi-coloured. Skull very similar but the palatal foramina more contracted posteriorly, ending less squarely; the rostrum weaker, not so deep; the incisors less stout and markedly less curved backwards.

Characters and colour. Pelage composed of flattened grooved spines and fine hair, grey ("dark gull grey") at the base; the spines about 8 mm. long on the back, with blackish tips, and the soft hair with buffy tips; the general colour-effect on upper parts and hind limbs being a dark brown (nearly "clove" brown) slightly grizzled with buff; sides of body greyer; sides of head and neck and the fore-limbs whitish; under side of hind-limbs, head and body white, the latter distinctly margined from the sides and clothed with a mixture of hair and fine spines about 5 mm. long, grey at base with white tips. Hands and feet white. Tail dark above and clad with dark hairs, pale below and clad with pale hairs.

Skull and teeth. Skull of medium proportions, braincase rounded. Nasals rounded anteriorly and posteriorly and terminating about level with the premaxillaries and with the anterior edge of the orbital spaces.

Supraorbital edges abruptly rounded off, but without ridge or bead. Anteorbital plate sloping considerably backwards from base to zygoma and scarcely convex.

Dorsal profile of rostrum straight between tips of nasals and mid-frontals: top of braincase flattened when viewed from behind.

Palatal foramina short and broad, their greatest combined breadth in front of their mid-length, rounded posteriorly and falling short of the molars by at least 1 millimetre.

Front wall of first molar nearly vertical: tooth-rows converging posteriorly.

Mesopterygoid space broad and parallel-sided, scarcely reaching the level of the last molars.

Bullae of normal size and dilation, as in *Mus*.

Measurements. See table postea.

Type. Adult female (skin and skull) No. 2621/CBK. Collected at Me Taw, 1500 ft., Western Siam, 40 miles N. W. of Raheng, on 4th February 1917 by Mr. K. G. Gairdner. Orig. No. 357.

A second female (2620/CBK) was obtained at the same place on 5th March 1907. Orig. No. 385. It is slightly more buffy above than the type.

I shall not attempt to describe here the molars of these two specimens: they are not ivory-like, clearly grooved and channelled as in *Rattus*, *Mus*, etc., but are covered with a sort of translucent enamel which prevents details being clearly seen.

I am rather doubtful whether a third female with the same history (No. 2619/CBK: Orig. No. 372) is of this form, but until the mice of Siam are better known I leave it here.

It is rather darker and duller above than the others, being less grizzled with buff (perhaps owing to wear), while the base of the pelage is neutral grey: the hair of the under-parts is a little less spiny and is shorter so that the grey base is slightly more visible.

The skull is of the same general shape, but the nasals are sharply pointed posteriorly and extend beyond the premaxillaries which are not carried obliquely backwards with them.

The anteorbital plates are convex, practically perpendicular above the base.

The palatal foramina are narrowed anteriorly, have their greatest combined breadth behind their mid-length and terminate in line with the alveolar edge of the first molars.

Toothrows scarcely converging; the molars are much worn; but the incisors curve to the same slight degree as the other two: mesopterygoid space narrower.

Leggada rahengis nov.

Characters and colour. Upper pelage spiny, the spines about 7 mm. long with broad black tips mixed with fine hairs tipped with ochraceous, so that the general colour is a dark grizzle of och-

raceous-buff and blackish: sides of head and body rather more ochraceous buffy. Pelage throughout neutral grey at base. Sides of muzzle, limbs beneath and under-parts greyish-white, fairly clearly margined. Hands and feet white. Tail dark above and pale below, the hairs clothing it in agreement.

There appear to be three pairs of pectoral mammae: the inguinal number is not ascertainable.

Skull and teeth. Skull long and narrow: braincase markedly pear-shaped.

Nasals extending slightly beyond the premaxillaries and the anterior edge of the orbital spaces, rounded anteriorly, truncate posteriorly.

Supraorbital edges sharply angular but without ridge or bead. Anteorbital plates very angular, the apex slightly overhanging the base and the backward flexture very abrupt: a very small excrescence at the anterior foot, in no way approaching in size or shape the masseteric knob of *Mus*.

Dorsal profile of skull regularly curved, crown but little flattened. Palatal foramina long and almost parallel-sided, but their greatest combined breadth in front of their mid-length, truncate posteriorly and terminating in line with the anterior edges of the crowns of the first molars, considerably within the roots, which are exposed: toothrows converging posteriorly.

Mesopterygoid space narrow and diverging slightly posteriorly, scarcely reaching the level of the last molars.

Size and dilation of bullae normal, as in *Mus*.

Upper incisors nearly upright, as in *L. p. gairdneri*.

Measurements. See table postea.

Type. Adult female with very worn teeth (skin and skull) 2618/CBK. Collected at Me Taw, 1500 ft., 40 miles N.W. of Raheng, Western Siam on 7th. February 1917 by Mr. K. G. Gairdner. Orig. No. 362.

A single specimen only.

Remarks. This mouse is probably a race of *Leggada nitidula* (Blyth),[1] with which species it seems to agree in colour and in the possession of upper incisors about upright, or only very slightly recurved, and somewhat similar supraorbital ridges:[2] but it has the tail as much longer than that of *L. n. popæa*[3] as the tail of that form is longer that that of *L. n. nitidula.* It is also otherwise larger than either.

Measurements of Mice in millimetres.

	Leggada pahari gairdneri			*L. rahengis*
	Type. 2621/CBK.	2620/CBK.	2619/CBK.	Type 2618/CBK.
Sex	♀	♀	♀	♀
Head and body	93.5	91	—	88.5
Tail	—	88	—	86
Hindfoot, s. u.	21	20	—	17
Ear	15	14.5	—	15
Skull:—				
greatest length	25.5*	24.5*	24.0	26.0
condylo basilar length ...	23.0	21.2	—	23.7
palatilar length	11.2	10 4	10.1	12.1
diastema	7.5	7.2	6.2	7.5
upper molar row (alveoli) ...	3.9	3.7	4.0	5.0
do do (crowns) ...	3 7	3.5	4.0	4.0
length of palatal foramina ...	4.5	4.0	4.8	5.5
combined nasals	9.8 x 2 6	9.5* x 2.7	9.4 x 2.6	10 0 x 2.8
zygomatic breadth	12.2	11.6	12.0	12.2

1. *Mus nitidulus* Blyth, Journ. Asiat. Soc. Bengal, xxviii, 1859, p. 294 (Shwegyin, N. Tenasserim).

2. *Vide* Thomas, op. cit. xxvi, pp. 418, 420.

3. Thomas, op. cit., p. 420.

* Approximate.

On Rattus blythi Kloss (Mus cinnamomeus Blyth).

With remarks on allied forms.

By C. Boden Kloss, f.z.s.

In a collection of mammals made by Mr. K. G. Gairdner near Raheng, Western Siam, are several examples of a rat which I identify, after comparison with the type, as *Rattus blythi* mihi *(Mus cinnamomeus* Blyth) – a form that does not seem to have been met with since it was first described by Blyth in 1859 and given a name unfortunately preoccupied and therefore untenable.

Mr. Gairdner's series consists of seven skins and six skulls taken during February and March, 1917, at Me Taw and Sikawtur, 1500 ft., about 40 miles N. W. of Raheng – a locality a hundred miles distant from Shwegyin in North Tenasserim where the type specimens were obtained by Major Berdmore.

In 1917 I contributed some notes to the "Records of the Indian Museum" (vol. xiii, p. 7) on the tailless type of "*Mus cinnamomeus*" and compared it with *Rattus cremoriventer cremoriventer*,[1] which it closely resembled in colour.

Mr. Gairdner's specimens show, however, that *R. blythi* has a bicoloured tail – a character that at once proves it to belong to a different species; for *cremoriventer* has a tail dark throughout and also almost pencillate, while that of *blythi*, though well clad in a normal way, has no elongate hairs at the tip.

Further, while the upper pelage is of the same composition and of practically similar colour, the fresh specimens show that *blythi* is beneath of a whiter, less creamy tone than *cremoriventer*.

As regards the skulls, those of *blythi* have less spatulate nasals but broader anteorbital plates, while the palatal foramina extend back to a line joining the front molars: in *cremoriventer* they fall short of this.

The upper incisors of *blythi* curve backwards noticeably more than do those of *cremoriventer*, which in this respect is resembled, among rats of this group directly known to me, only by *Rattus*

1. *Vide* Notes on page 68 postea.

orbus,[2] a member of the bicoloured-tailed section (The curve of the incisors is not a very satisfactory character in this connection, as the differences are not great, but the skulls of some of the rats of the group are so alike that it is of some use). *R. blythi* is also a larger animal and in size comes near *R. c. tenaster*.[3]

R. blythi differs from *orbus* in having much less intensely coloured upper parts and whiter undersurface: has a shorter tail with a larger white area, narrower interpterygoid space, narrower, more parallel-sided, palatal foramina.

The skull and teeth of *blythi* do not appear to differ materially from those of *Rattus bukit*,[4] but the fur is brighter coloured above and whiter below; the white of the hind leg is more frequently cut off from that of the foot; the hair of the tail distally is often white above, while that of *bukit* is dark; and the pelage is looser, less compact of spines and not so stiff (thus like *cremoriventer*).

In the same way that the upper incisors of *blythi* and *bukit* differ from *cremoriventer*, so do those of *marinus*.[5] However, *blythi* may be distinguished from this last by its smaller palatal foramina and narrower interpterygoid space, while its colour is a little brighter above and less creamy below.

The differences between the above forms may be set out as follows:—

A. Tail unicoloured, somewhat pencillate, incisors less curved backwards.
 a. Smaller. *R. c. cremoriventer*.
 b. Larger. *R. c. tenaster*.
B. Tail bicoloured, no longish hairs at tip.
 a. Incisors less curved backwards, tail with less white below and generally over 200 mm. long, bullae larger. ... *R. orbus*.
 b. Incisors more curved backwards, tail with more white below and generally less than 200 mm. long, bullae smaller
 *a*1 Palatal foramina larger. ... *R. marinus*.
 *b*1 Palatal foramina smaller.
 *a*2 Colour duller, pelage stiffer. ... *R. bukit*.
 *b*2 Colour brighter, pelage less stiff *R. blythi*.

2, 3, 4, 5. *Vide* Notes on page 68 postea.

All these rats are medium-sized animals with tawny to clay-coloured upperparts thickly sown with flattened spines having pale horny green bases, strongly margined whitish or creamy underparts and bicoloured tails (except *cremoriventer*), while the bullae are small and flattened.

Others of the same group, not referred to above, are:— *R. pan*,[6] like *bukit*; but the white of the underparts not extending to the hind feet, interpterygoid space more abruptly truncate anteriorly, rostrum rather heavier and nasals longer. *Rattus pan* and *marinus* are undoubtedly local forms of *R. bukit*, whereas *gracilis* and *orbus* probably represent *R. rapit* Bonhote (t. c., p. 123) from Kina Balu, North Borneo.

A rat not known to me by topotypical examples is *R. lepidus*.[7] A single specimen from North Siam referred to it[8] – except for decrease in the number and size of spines – seems not to differ materially from *R. bukit*.

I have seen no specimens of *R. gracilis*[9] which Mr. Thomas stated (l. c.) to be closely allied to *R. bukit*, but later (*in litt.*) concludes is the same as *R. orbus*: if so it is quite different from *blythi* and from *bukit*; and it must be admitted that while *orbus* was being described *gracilis* was entirely over-looked.

Rattus sakeratensis[10] I am quite unable to place for the present; it was founded on a single specimen which I have not seen.[11]

The following are the description and measurements of Mr. Gairdner's series of *Rattus blythi*:—

Upper pelage thickly set with broad spines with greenish bases and grey tips: rump sown with long black-tipped piles. Tail dark above and whitish below. Colour above cinnamomeus, intermediate between ochraceous-tawny and the same tinged with amber-brown; the back streaked by the blackish tips of the spines: base of fur grey. Head, sides and limbs more ochraceous-buffy.

6, 7, 8, 9, 10, 11. *Vide* Notes on page 68 postea.

Underparts, hands and feet creamy white (ivory yellow); white of hind feet sometimes continuous with that of the leg and sometimes striped mesially with brown. Hair of the upper surface of the tail sometimes whitish distally. (In No. 2627 the whole tail is white for more than half its length, both skin and hair; in No. 2622 for less than a quarter.)

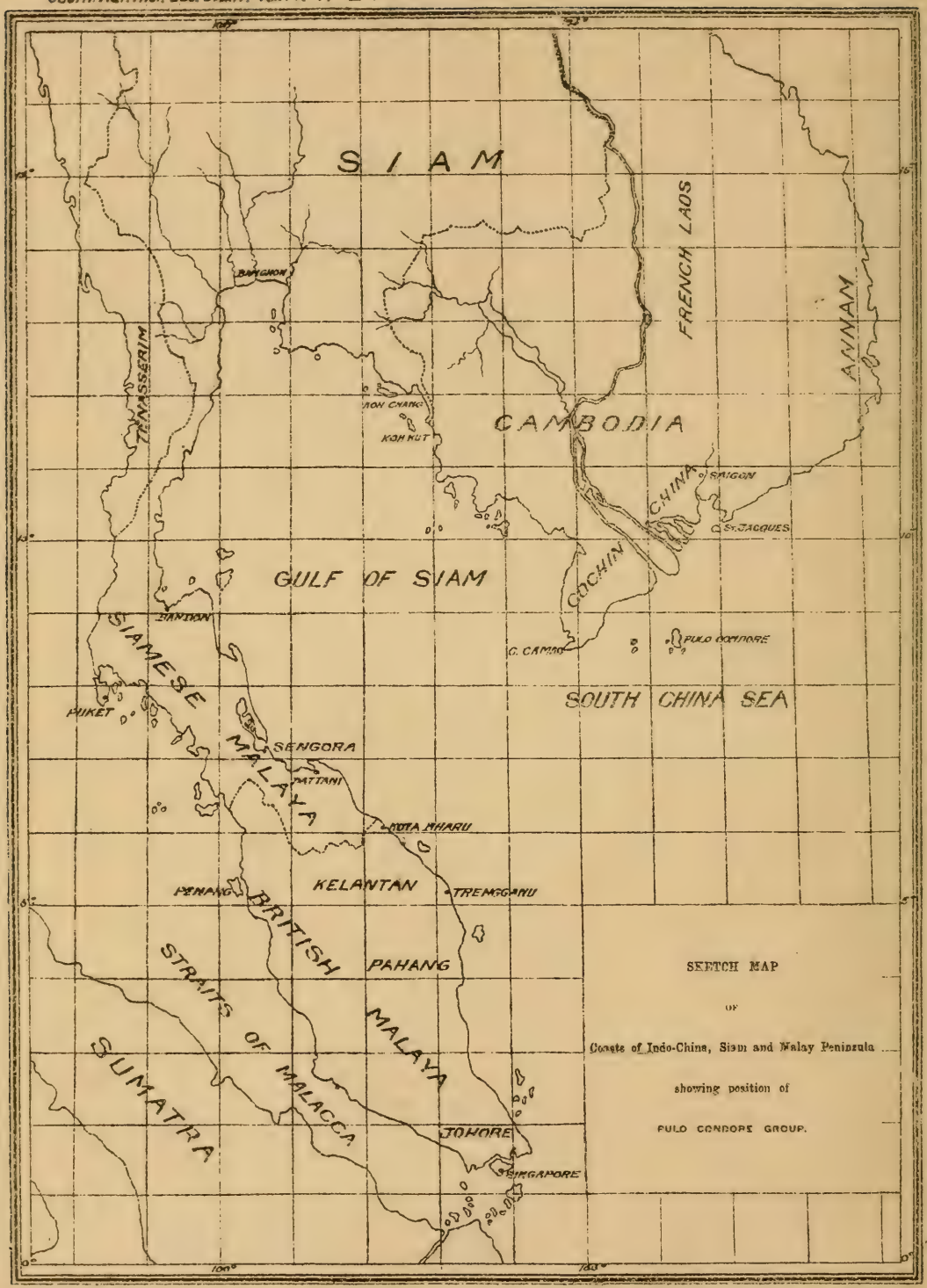
Notes.

1. *Mus cremoriventer* Miller, Proc. Biol. Soc. Washington, xiii, 1900, p. 144, pl. v. figs. 2, 2a, 2b (Trang, 3000 ft., Peninsular Siam).
2. *Epimys orbus* Robinson & Kloss, Ann. & Mag., xiii, 1914, p. 228 (Kao Nong, Bandon, 3500 ft., Peninsular Siam).
3. *Epimys tenaster* Thomas, Ann. & Mag., xvii, 1916, p. 425 (Mt. Muleyit, 5-6000 ft., Tenasserim).
4. *Mus bukit* Bonhote, Ann. & Mag., xi, 1903, p. 125 (Bukit Besar, Patani, Peninsular Siam).
5. *Epimys marinus* Kloss, P. Z. S., 1916, p. 50 (Koh Chang Id., S. E. Siam).
6. *Epimys jerdoni pan* Robinson & Kloss, t. c. s., p. 229 (Koh Samui Id., West coast of Peninsular Siam).
7. *Epimys lepidus* Miller, Smithsonian Miscellaneous Quarterly, 61, 1913, p. 20 (Bok Pyin, South Tenasserim).
8. *Vide* Journ. Nat. Hist. Soc. Siam, iii, 1918, p. 60 (Muang Prae).
9. *Epimys gracilis* Miller, Sm. Misc. Quart., 61, 1913, p. 21 (Mt. Muleyit, 5-6000 ft., Tenasserim).
10. *Rattus sakeratensis* Gyldenstolpe, Kungl. Sv. Vet. Akad. Handl., 57, 1917, p. 46, pl. vi, figs. 6 & 9 (Sakerat, south of Korat Town, Eastern Siam).
11. *Vide* Journ. Nat. Hist. Soc. Siam, iii, 1919, p. 381.

Measurement of *Rattus blythi* in millimetres.

Locality	Sex	Head and body	Tail	Hind foot	Ear	SKULL. Greatest length	Condylo-basilar length	Palatilar length	Diastema	Upper molar row (alveoli)	Combined palatal foramina	Nasals	Zygo-matic breadth	No.	Remarks.
Sikawtur and Me Taw															
Near Raheng, W. Siam	♂	153	195	28.5	20.5	—	—	—	—	—	—	—	—	2622	
,, ,,	♀	125	169	28	19.5	—	—	15	8.7	6.1	6.1x2.4	13.0x4.0	17.2	2623	
,, ,,	♀	123	160	26	19.5	35.3	29*	14.8	8.4	6	5.5x2.1	13.0x3.9	17.8	2624	
,, ,,	♂	138	183	27	20	36.9	30.5*	15.6	9.3	6	6.0x2.6	13.8x4.1	17.5	2625	
,, ,,	♀	134	177	27	20	36.5	29.1	15	8.9	6.1	6.0x2.1	14.3x3.8	17	2626	
,, ,,	♂	135	175	28.5	21	37.3	30.6	15.3	9	6.3	5.9x2.5	13.8x3.9	17.1	2627	
,, ,,	♂	152	161	34	22.5	41.2	33.9	16.5	10.3	6.1	6.3x3.0	16.4x4.7	19.4	2628	Teeth much worn.
Shwegyin, N. Tenasserim	—	152	197	32	—	38*	—	15.4	9.4	6	6.4x —	13.9x3.9	—	336A	Type of R. blythi, † co-type of M. cinnamomeus‡
,, ,,	♂	125*	198	31	—	35	—	14.8	8.1	6.3	5.6x —	11.8x3.7	—	336B	Co-type of M. cinnamomeus.
Pa Wa Gorge, N. Siam	♀	148	160	26	—	—	—	15.9	9.5	6.1	7.0x2.4	14.0x4.2	17.8	2508	Teeth worn.**

*Approximate. †Teeth only slightly worn. ‡Rather younger than the type. **The Pa Wa specimen has the fur exceedingly worn and the skull damaged: it seems, however, only to differ from the rest in having longer palatal foramina and more creamy underparts and may be placed with them for the present. Mammae 2-2=8.


SIAM
FRENCH LAOS
ANNAM
TENASSERIM
BANGKOK
KOH KUT
CAMBODIA
CHINA
SAIGON
St. JACQUES
COCHIN
GULF OF SIAM
BANDON
SIAMESE
MALAYA
PUKET
SENGORA
PATTANI
KOTA BHARU
PENANG
KELANTAN
TREMGGANU
BRITISH
PAHANG
STRAITS OF MALACCA
MALAYA
SUMATRA
JOHORE
SINGAPORE
C. CAMAU
PULO CONDORE
SOUTH CHINA SEA
SKETCH MAP
OF
Coasts of Indo-China, Siam and Malay Peninsula
showing position of
PULO CONDORE GROUP.

A NEW GIANT SQUIRREL FROM PULO CONDORE.

By C. Boden Kloss, F.Z.S.

Ratufa melanopepla condorensis, subsp. nov.

3 ♂ ad., 3 ♀ ad., 1 ♀ subad. Main Island, Pulo Condore Group, near Cochin China.

8–13th September 1919 (Nos. 2700–6/CBK). Dr. Malcolm Smith's collector.

The smallest black-and-tan Giant Squirrel known: hindfoot apparently not exceeding 60 mm. Skulls showing no special peculiarities apart from abnormally small size, the greatest length yet known being 64 mm.

Colour generally resembling *R. m. leucogenys* mihi (P. Z. S. 1916, p. 43. South–East Siam), geographically the nearest known form (though perhaps the upper parts are never so intensely black); but the yellow parts a trifle richer, more like *R. m. sinus* mihi (t. c., p. 44. Koh Kut Id., S. E. Siam) and *R. m. peninsulæ* Miller (Proc. Wash. Acad. Sci. II, 1900, p. 71. Trang, Peninsular Siam).

The yellow of the hindlegs sometimes extends over the upper surface of the feet and sometimes only reaches their inner sides. In one specimen the black part of the lower leg is grizzled with buff. Otherwise the seven specimens examined are very uniform in appearance except that Nos. 2702 and 2704 have the upper parts, owing to bleaching, largely dark brown and No. 2703 only slightly so. There is always a russet patch between the ears.

Type. Adult female (skin and skull). No. 2706/CBK. 11th September 1919.

All those Giant Squirrels, which I have referred to *Ratufa melanopepla*, should probably stand as races of *R. bicolor* (Sparmm. Java) of which *melanopepla* itself is undoubtedly a subspecies, and *gigantea* (McClell, Assam) also, though in a small area (North Siam) the latter is found together with an animal with untufted ears (*R. phæopepla* Miller, Smithsonian Misc. Collections, vol. 61, No. 21, 1913, p. 25. South Tenasserim).

Measurements of *Ratufa melanopepla condorensis.*

Species and Locality	Sex	Head and body.*	Tail.*	Hind foot s. u.*	Ear.*	SKULL. Greatest length	Condylo-basilar length	Palatilar length	Diastema	Upper molar row (alveoli)	Median nasal length	Inter-orbital breadth	Zygo-matic breadth	No. CBK.	Remarks.
Ratufa melanopepla condorensis.															
Pulo Condore, near Cochin-China	♂	286	350	55	19	63	52	23	13.2	12	19	25	39.5	2700	Teeth slightly worn.
,, ,,	♂	290	344	55	21	61.5	50	22	13	12	16.5	24	—	2701	,, ,, ,,
,, ,,	♂	300	360	57	22	62	52	21.6	12.7	11.7	21	24	37.7	2702	,, scarcely ,,
,, ,,	♀	303	350	60	22	62.5	51	23	12.3	12	20	24	38	2703	,, unworn.
,, ,,	♀	300	350	59	25	62.5	52	23	13.2	12	19	25	39.5	2704	,, slightly worn.
,, ,, Type	♀	320	370	55	23	64	53	23.2	13.9	12.1	20.2	25.8	39.8	2706	,, ,, ,,
,, ,, Subad	♀	270	350	57	22	60	49.5	22	11.8	12.6	18.5	22	35.2	2705	,, unworn.

* Native collector's measurements, taken in the flesh.

THE PULO CONDORE GROUP AND ITS MAMMALS.

By C. Boden Kloss, F.Z.S.

The Pulo Condore[1] group lies about 45 miles from the coast of Cochin-China on the edge of a 15–fathom bank stretching out from the mainland.

It consists of one comparatively large island, two of moderate size and eight or ten small ones, and is fairly compact.

Pulo Condore, the largest, is about nine miles long and two to four in breadth: most of its surface is hilly and its summit is 1,954 ft. high. The eastern side is divided into two bays by a rocky peninsula and in the southern and larger of the two is situated the settlement and convict establishment. This bay is protected to some extent on the east by the island of Hon Bai Kan, the second largest of the group, nearly three miles long and rising 1,076 feet.

Rather smaller than Hon Bai Kan is Ban Vioung, or Little Condore, 708 feet high, lying close to the south-west shore of the main island where it creates a channel that offers fairly protected anchorage.

I have not yet landed on the group, but the following short notes were made during a passage through the islands in March 1917, when my steamer anchored one evening for half an hour in the principal harbour: they are, therefore, merely impressions of the east side and perhaps a visit would cause them to be considerably amended.

"We stopped in a semicircular bay open to the south-east, with three or four islets in the mouth and larger ones to seaward.

"The settlement is on a plain along the head of the bay fronted by a sandy beach and backed by hills: few buildings were visible from the ship. The Governor's hot-weather quarters are

[1] The Island of Gourds. (Pulo, poulo, pulau (Malay) = Island. Condor, Condore, Kundur (Malay) = Gourd.
I follow the spelling of the Admiralty charts.

built on a knoll at the southern end of the flat land: the house, formerly known as 'Fort Anglais,' is now called 'Villa des Alliés'.

"Behind the plain rises a semicircle of hills, irregular in height, sometimes steep, sometimes with a gradual slope: there appears to be one low pass to the western side of the island.

"Except for the plain and the neck of the peninsula which forms the northern part of the island, the land seen was hilly everywhere and apparently not fertile: it seems to consist of many rocky slopes and some precipices and, where wooded, there were apparently growing only small trees, much wind-contorted and without much undergrowth.

"At the south of the island opposite Little Condore – which has a high steep peak and some cliffs – there is a stretch of forest on the lower slopes, but much of the island above this was practically naked.

"The northern part of Pulo Condore has a lesser elevation than the rest of that island except for the neighbourhood of the settlement, and some of the hills behind, which seem to be forested.

"The islets to seaward seemed to be very rocky and sterile, the only woody growth being wind-twisted trees and scrub."

There are no modern descriptions in English of the islands other than that in the "China Sea Directory," but good accounts have been given of visits in 1687 by Dampier (The Voyage round the World); in 1780 by Captain James King, LL. D., F. R. S. (A Voyage of Discovery into the Pacific Ocean, Vol III = Captain Cook's Third Voyage); and in 1822 by Dr. George Finlayson (The Mission to Siam and Hue) and by John Crawfurd, F. R. S. (Journal of an Embassy to Siam and Cochin China).*

*In Staunton's "Embassy to China," under Lord Macartney, occurs a short account of a visit paid in May 1793. Turtles are the only animals mentioned.

These travellers record the following animals:—

Monkeys. Fisher, Finlayson, Crawfurd.
Flying Squirrel (striped brown and white). Fisher.
Black squirrel. Fisher, Finlayson, Crawfurd.
Wild pig. Dampier, Fisher, Finlayson.
Wild cocks and hens. Dampier, Fisher.
Doves and Pigeons. Dampier, Crawfurd (*M. bicolor* and *M. aenea*).
Parrots and parakeets. Dampier.
Turtles. Dampier, Staunton.
Lizards. Dampier.
Iguanas (*Varanus* sp.). Dampier.
Limpets and Mussels. Dampier.

The group does not look like one with a rich mammalian fauna. Dr. Malcolm Smith's investigations (in September 1919 he sent two of his collectors to the islands, where they spent about a fortnight, with instructions to obtain mammals as well as reptiles and batrachians) have, however, considerably increased our knowledge of it by adding, to the five determined species on record, four more of which one, at least, is new—the Giant Squirrel: and perhaps the Macaque and the Palm-Civet also; but of this last the only example obtained is too young to speak about.

We have still to receive specimens of the Wild Hog and Flying Squirrel of the earlier visitors: and it is probable that there will eventually be discovered a lesser Fruit-bat (*Cynopterus* sp.) and one or more insectivorous bats, a race of Forest-rat (*R. rajah* subsp.) and a Mouse-deer (*Tragulus* sp.)

1 **Macaca irus** Cuv., subsp.

1 ♂ aged, 1 ♂ adult, 1 ♀ aged. Pulo Condore, 19–23 Sept. 1919. [Nos 2691, 2, 3/CBK.] Dr. Malcolm Smith's collector.

These Macaques are either *M. i. validus* (Elliot, Ann. & Mag. Nat. Hist. (8) VI, 1909, p. 252: stated to have come from Cochin-China) or are closely related to it.

I have a male Macaque from Trangbom, 30 miles east of Saigon, to which they bear a general resemblance : but until I have compared the specimens from both places with the type of Elliot's race they had better remain undetermined subspecifically.

All these do not differ in colour from *M. i. atriceps* mihi (Journ. Nat. Hist. Soc. Siam, III, 1919, p 347. Koh Kram Id., Inner Gulf of Siam) as much as I thought from Elliot's description of it that *validus* did. *M. i. atriceps,* however, is easily separated from the Cochin-China and Pulo Condore animals in having the black area on the crown smaller and much more sharply margined, while its skull can easily be distinguished by the unusually small size of the orbits : it is further separated from the Pulo Condore examples by the larger molars and more arched, horse-shoe shaped palate, the breadth of which between the last molars is much reduced.

This is the first time the Pulo Condore "monkey" has been identified as a form of Macaque.

I give, with the measurements of the present specimens, the dimensions of two more examples of *M. i. atriceps,* sent me by Mr. W. J. F. Williamson, which confirm the description of the original series.

Measurements of *Macaca irus* subsp. from Pulo Condore and *M. i. atriceps* from Koh Kram.

	Pulo Condore.			Koh Kram.	
No.	2691	2692	2693	2567	2568
Sex	♂	♂	♀	♂	♀
	Aged: slight saggital crest, teeth excessively worn.	Adult: no crest, teeth unworn.	Adult: no crest, teeth much worn.	Adult: saggital crest, teeth worn.	Just adult: teeth unworn.
Head and body*	435	480	380	465	415
Tail*	498	540	470	510	465
Hind foot, s.u.*	126	128	110	133	118
Ear*	44	45	32	43	42
Skull and Teeth:—					
Greatest length...	124	113.5	106.5	119	100
Basal length	90	80	72	86.5	68
Palatal length	53	49	43.5	57.5	43
Zygomatic breadth	84.2	81	69	...	67
Upper toothrow excluding incisors (alveoli)	36	38	44	39	36
Upper molar series only (alveoli)	29.7	30.5	30	32.2	31.8
m^2—m^2 externally (alveoli) ...	37	34.6	31	37.5	33.6
Lower toothrow excluding incisors (alveoli)	45	44	39	44.5	39.5
Lower molar series only (alveoli)	37.7	37.8	34.2	37.5	34.6
Length of mandible	91	85	77	89.5	74

* Native collector's measurements, taken in the flesh.

2. Paradoxurus hermaphroditus Pall., subsp.

1 ♀ imm., 12 Sept. 1919 [No. 2694/CBK]. Dr. Malcolm Smith's collector.

New for the islands; but only represented by a quite young female. On geographical grounds it might be *P. h. cochinensis* Schwarz (Ann. & Mag. Nat. Hist. (8) VII, 1911, p. 635, Saigon)[1] ; but, like another young female from Koh Chang Id., S. E. Siam (vide P. Z. S. 1916, p. 33), the pale frontal band is broad.

3. Tupaia glis dissimilis (Ellis).

Sciurus dissimilis Ellis in Gray, Ann. & Mag. Nat. Hist. (3) 1860, V, p. 71 (Pulo Condore).
Tupaia dissimilis Lyon, Proc. U. S. Nat. Mus., 45, 1913, pp. 3,67, pl. 1 (Pulo Condore).

1 ♂ ad., 1 ♂ subad.,1 ♀ ad., Pulo Condore, 12 – 15 Sept. 1919.

[Nos. 2695 – 7/CBK.] Dr. Malcolm Smith's collector.

Number of mammæ unknown: but almost certainly 3 – 3=6. Upper parts a grizzle of blackish and ochraceous (more buffy on the sides); tail similar but grizzle coarser. Sides of head and neck with less black than the back; upper and lower eyelids clear buffy. Outer sides of limbs like the body, but grizzling less distinct.

Underparts buffy to ochraceous buff: under side of thighs darker, ochraceous tawny. Under side of tail buffy and black, more buffy down the median line. Neck stripes scarcely traceable, buff.

On the whole the general colour of the upper parts is more like *T. g. belangeri* (as represented by specimens from Siam: vide Kloss, J. N. H. S. S. III, 1919, p. 355) than the more adjacent *T. g. cambodiana* mihi (l. c., p. 357) in that the tail is less black and more like the rump than the shoulders. It is more like the former also in the possession of a more pronounced eye-ring. The neck stripes are, however, less pronounced than in either, far less so than in the former; and the underparts are more richly coloured

[1] An unsatisfactory name, as Cochin is in Madras.

than in the others, which are buffy or whitish below, while the tail is also rather more ochraceous throughout.

Here we seem to have a case of the Pulo Condore race being more allied to Siamese and Cambodian forms than to more adjacent ones from Cochin China and Annam.

Measurements of *Tupaia glis dissimilis*.

No.	2695	2696	2697
Sex	♂ ad.	♂ subad.	♀ ad.
Head and body*	185	175	165
Tail*	173	168	162
Hind foot, s. u.*	39	34	36
Ear*	14	14	14
Skull and teeth :—			
Greatest length	48	46	—
Basal length	41.5	40	41
Palatal length	24	24	24.5
Upper molar series (alveoli)	15	14.8	14.8
Tip of *pmx* to lachrymal notch	17.8	17.7	17.6
Rostral breadth at diastema	6.8	6.5	6.0
Interorbital breadth	13.8	13	13
Zygomatic breadth	24	23	23

* Native collector's measurements, taken in the flesh.

4. Crocidura murina (Linn.).

1 ♂ ad., 1 ♀ subad., 7 Sept. 1919 [Nos. 2698, 9/ CBK.]. Dr. Malcolm Smith's collector.

Medium sized animals, in colour grey tinged with brown. New for the islands.

5. Pteropus hypomelanus condorensis Peters.

Pteropus condorensis Peters, M. B. Akad. Berlin, 1869, p. 393 (Pulo Condore).

Pteropus hypomelanus condorensis Anderson, Cat. Chiroptera B. M., 1, 1912, p. 110.

Not obtained by Dr. Smith's collector. Very few topotypes have been collected and all Museum specimens have been mounted and must now be more or less faded.

6. Rhinolophus minor (Horsf.).

Not obtained by Dr. Malcolm Smith's collector.

Recorded from Pulo Condore by de Pousarges (Mission Pavie Indo-Chine, Etudes Diverses III, 1904, p. 544).

7. Ratufa melanopepla condorensis Kloss.

Antea, p. 71.

New for the islands.

8. Sciurus germaini A. M.-Edw.

Sciurus germanii A. Milne-Edwards, Rev. et Mag. Zool. 1867, p. 193 (Pulo Condore)

5 ♀ ad., Pulo Condore, 8—10 Sept. 1919 [Nos. 2707—11/ CBK.].

Intense black all over, lustrous on the tail and upper parts.

This squirrel is so isolated that it is difficult to decide whether other black animals should be treated as subspecies of it. One, *S. albivexilli* mihi (P. Z. S. 1916, p. 47) occurs only on Koh Kut Id., S. E. Siam; while the second, *S. nox* Wroughton (Ann. & Mag. Nat. Hist. (8) II, 1908, p. 397) seems confined to a small area of Siam

lying between Cape Liant and Sriracha to the north. The Koh Kut animal, besides being larger, has a white tail tip: but the other only differs in greater size.

It is curious that the isolated squirrels from Siam and Pulo Condore should resemble each other so closely in colour, while *Macaca atriceps irus*, from Koh Kram, an island a few miles from Cape Liant, also resembles the Pulo Condore Macaque much more nearly than it does animals from the adjacent Siamese mainland.

Here too we have a case, as with the Tupaia, of another Pulo Condore animal more closely resembling forms from Siam than others of the nearer parts of Indo-China.

Measurements of *Sciurus germaini*.

No.	2707	2708	2709	2710	2711
Sex	♀	♀	♀	♀	♀
	Teeth much worn.	Teeth slightly worn.	Teeth slightly worn.	Teeth slightly worn.	Teeth worn.
Head and body* ...	190	185	180	185	195
Tail*	168	165	160	160	160
Hind foot, s.u.*	39	36	38	37	40
Ear*	18	19	18	20	18
Skull and teeth :—					
Greatest length ...	47.5	47.3	45.8	48.0	48.8
Condylo-basilar length ...	41.0	40.0	37.5	39.8	41.3
Palatilar length ...	19.4	20.0	18.8	19.0	20.3
Diastema	10.7	10.5	9.9	9.5	11.0
Upper molar row (alveoli)	9.0	8.9	8.9	9.4	9.5
Median nasal length ...	13.0	14.1	14.0	14.0	14.8
Interorbital breadth ...	17.6	16.7	16.0	16.2	17.2
Zygomatic breadth ...	28.3	28.0	27.0	27.5	29.0

* Native collector's measurements, taken in the flesh.

·6 Rattus rattus germaini (A. M.-Edw.).

Mus germaini A. Milne-Edwards, Rech. Mamm., 1874, p. 289 (Pulo Condore); Bonhote, Fasciculi Malayenses, Zool. 1, 1903, p. 37 ("Cochin China." Errore?); id., P. Z. S, 1905, p. 390.

Mus germani de Pousarges, Mission Pavie Indochine, Etudes Diverses, III, 1904, p. 548 (Poulo-Condore).

1 ♂ ad., 1 ♂ vixad., 1 ♂ subad., Pulo Condore, 8—13 Sept. 1919 [Nos 2712—4/CBK.]. Dr. Malcolm Smith's collector.

Above:—a grizzle of ochraceous and black (the subadult animal ochraceous-buff and black): base of fur dark grey showing somewhat on the sides and lower parts of the limbs. Hands and feet white. Below:—the adult whitish on the neck, the remaining part creamy, the bases of the hairs scarcely grey: scrotum partly rufous (possibly stained). The scarcely adult animal ivory, the bases grey where the white underparts meet the colour of the sides. The subadult example almost throughout greyish white below owing to the pronounced grey bases. Tails dark throughout.

Skulls robust without any peculiar features, except that in the oldest and youngest specimens the palatal foramina (which are, combined, long ovals) are rather abruptly contracted for the anterior two millimetres. Rostrum fairly long and rather slender.

I cannot hold with Bonhote that this rat has anything to do with *R. griseiventer* (Fascic. Mal., t. c., pp. 35—8): it is a member of the coarser, more heavily built, white-bellied section of *rattus* rats, which are quite distinct from that animal and its allies.

Measurements of *Rattus rattus germaini.*

No.	2712	2713	2714
Sex	♂	♀	♂
	Teeth slightly worn.	Teeth scarcely worn.	Subad., teeth unworn.
Head and body*	190	174	159
Tail*	225	221	165
Hind foot, s.u.*	37	35	39
Ear*	24	24	22
Skull and teeth:—			
Greatest length	44.0	43.0	39.4
Condylo-basilar length	39.0	37.0	34.2
Diastema	12.3	11.0	9.9
Upper molar row (alveoli) ...	7.2	7.9	7.1
Combined palatal foramina ...	8 × 3 4	7.8 × 3	7.1 × 3
Median nasal length	17.0	15.8	13.7
Breadth combined nasals	5.1	4.5	4.8
Zygomatic breadth	20.1	20.0	18.3

* Native collector's measurements, taken in the flesh.

SOME BIRDS FROM PULO CONDORE.

By H. C. Robinson and C. Boden Kloss.

Mr. W. J. F. Williamson, who sent his collector to Pulo Condore with Dr. Malcolm Smith's men in September 1919, has not attained the success he deserved in investigating the avifauna of the island, for the collector was, unfortunately, laid up with dysentery for a week out of the 17 or 18 days he spent there. So the set of specimens brought back was not as large, nor the exploration as exhaustive, as it might have been.

It is curious that more seems to have been learnt of the birds of this little group of islands a century and a half ago than in more recent times: Linnaeus recorded the Jungle-fowl as *Phasianus gallus* in 1766; Gmelin described the Shama, *Turdus macrourus*; and Sparrman, the Roseate Tern, *Larus polo-condore* (better known as *Sterna dougalli* Mont.), in 1788; while Dampier (1687), King (1780), and Crawfurd and Finlayson (1822)* wrote of Parrots and "Parakites", Doves and Pigeons.

If, therefore, I am correct in believing that the islands have not received attention in later days, Mr. Williamson has added considerably to our knowledge of its birds in spite of his ill-luck: nevertheless there must still be, comparatively speaking, a good many more to be met with and it is to be hoped that Mr. Williamson may be able to send his collectors again to the island.

The present collection was submitted to my colleague for determination, but owing to press of work and illness Mr. Robinson was unable to deal with more than half the species, among which he distinguishes a new form of *Mixornis rubricapilla*. C.B.K.

1. Muscadivora aenea subsp. (?).

Muscadivora aenea ? subsp. Hartert, Nov. Zool. XXV, 1918, p. 346 (Hainan).

1 ♀. "Iris red, bill green, feet red". Total length, 405. Wing, 228 mm.

The material available is not sufficient to determine the status of this bird, which probably represents a subspecies as yet unnamed

*Vide antea pp. 74, 75.

but which also occurs in Cochin China and possibly Hainan. The vinaceous colour on the lower surface and the head is more pronounced than in most specimens from the Malay Peninsula, which are *M. ae. aenea*, though this can be matched in birds from Cambodia and East Siam. The size is about that of the South Indian and Ceylon *M. ae. pusilla* (Blyth); smaller than *M. ae. sylvatica* (Tick.), from which it also differs in the vinaceous ear-coverts. The nape and upper mantle are also darker grey than in any Malayan specimens we have examined.

In this connexion Hartert's remarks (supra) should be studied. We are reluctantly compelled to use the name *Muscadivora* for the genus instead of the more familiar *Carpophaga*, as the case for the former name seems unanswerable.

+ 2. Tringoides hypoleucos.

Tringa hypoleucos, Linn., Syst. Nat. i. 1766, p 250 (Europe).

1 ♀. "Iris dark brown, bill black." Total length, 310. Wing, 111 mm.

+ 3. Bubulcus lucidus coromanda.

Cancroma coromanda, Bodd., Tabl. Pl. Enl. 1783, p 54 (Coromandel Coast).

1 ♀. "Iris yellow, bill deep yellow, legs black". Total length, 495. Wing, 237 mm.

The presence of the Cattle Egret on an island of this description is somewhat unusual. The bird is in winter plumage.

+ 4. Alcedo ispida bengalensis.

Alcedo bengalensis, Gm., Syst. Nat. i, 1788, p. 450 (Bengal).

1 ♂. "Iris brown, bill black, feet red." Total length, 170. Wing, 72 mm.

The bird, which is not quite adult, calls for no special remark.

+ 5. Collocalia francica germaini.

Collocalia germaini Oustalet, Bull. Soc. Philom., 1876, p. 1 (Pulo Condore, Cochin China).

Collocalia francica merguiensis subsp. b., Hartert, Cat. Birds Brit. Mus. XVI, 1892, p. 506 (Mergui, Tenasserim).

Collocalia francica germaini Oberholser, Proc. Acad. Nat. Sci. Philadelphia, 1906, p. 201.

1 ♂, 4 ♀. "Iris dark brown, bill black, feet pale fleshy." Total length, ♂ 115; ♀ 119, 121, 120, 120. Wing, ♂ 108; ♀ 123, 123, 119, 116 mm.

With these fresh topotypes in hand we fancied we could keep apart from them birds representative of those to which Hartert gave the name *merguiensis*, on account of the less greenish gloss in the latter, which appeared to us to have the upper parts more brownish owing to the gloss being purplish. On submitting specimens to Dr. Hartert, however (who has himself withdrawn *merguiensis*, vide Oberholser, *supra*), he wrote us that he could still admit no differences. We must, therefore, disregard our own opinion.

6. Cypselus pacificus pacificus.

Hirundo pacifica, Lath., Ind. Orn. Suppl., 1801, p. 58 (New South Wales).

Micropus pacificus, Hartert, Cat. Birds Brit. Mus. xvi, 1892, p. 448.

1 ♂, 2 ♀. "Iris dark brown, bill black, feet pale flesh." Total length, ♂ 192; ♀ 194, 196. Wing, ♂ 189; ♀ 188, 186 mm.

These birds slightly exceed the maximum given by Hartert for the species, *viz.*, wing 184.5 mm., but cannot be separated from the typical form.

7. Rhopodytes tristis longicaudatus.

Phœnicophæus longicaudatus Blyth, Journ. Asiat. Soc. Bengal, X, 1841, p. 923 (Tenasserim).

Rhopodytes tristis hainanus Hartert, Nov. Zool. XVII, 1910, p. 218 (Hainan); Robinson & Kloss, Ibis, 1919, p. 427 (Cochin-China and South Annam).

3 ♂, 1 ♀. "Iris reddish brown, bill green, feet pale blue" (?). Total length, ♂ 545, 470, 520; ♀ 509. Wing, ♂ 159, 150, 160; ♀ 155 mm.

These birds agree in size and colour with Tenasserim specimens: Hainan birds also agree in size with Blyth's overlooked race. Topotypical examples vary a little: some being paler below

with a dirty-buff wash on foreneck and breast, while others are darker below, with the wash less evident. The four Pulo Condore birds resemble the latter.

† 8. Aegithina tiphia.

Motacilla tiphia, Linn., Syst. Nat., i, 1766, p. 331 (Bengal).

2 ♀. "Iris dull white, bill above blackish brown, below dull white, legs pale blue". Total length, 145, 135. Wing, 60, 61 mm.

There is nothing special to remark on these birds; they can be exactly matched by others from Annam and other parts of the Indo-Malayan region.

† 9. Pycnonotus finlaysoni.

Pycnonotus finlaysoni, Strickland, Ann. & Mag. Nat. Hist. xiii, 1844, p. 411 (♀ Malaysian Ids. *Errore*: substitute "Siam").

3 ♂, 2 ♀. "Iris reddish brown, bill blackish brown, legs pale brown." Total length, ♂ 200, 190, 192; ♀ 180, 192. Wing, ♂ 86, 83, 79; ♀ 76, 79 mm.

The specimens are all in moult and the wing measurements therefore are not reliable.

This bulbul, which is characteristically Indo-Chinese, is very constant is its colours and measurements, and in the very large series before us, ranging from Malacca to Pulo Condore, we have been unable to recognize any local differences whatever. The present birds are rather bright, but this is entirely due to their being in quite fresh feather.

† 10. Mixornis rubricapilla condorensis Robinson, subsp. nov.

The dullest form of the species; pileum with the rufous tinge duller and much reduced, general colour of the mantle more olivaceous, less russet, external aspect of the wing very little browner than the mantle and back.

Type. Adult male. Pulo Condore, 8th September 1919, collected by Mr. W. J. F. Williamson's native collector. Three specimens examined. "Iris dull yellowish brown, bill above blackish brown, below dull white, feet greenish yellow". Total length, ♂ 138,* 142; ♀ 130. Wing, ♂ 63,* 64; ♀ 58 (imp.).

*Type of the subspecies.

This race, which is just separable on the characters above given, shows an even greater departure from the typical form, than the forms inhabiting the southern Malay Peninsula and Sumatra, in the reduction of the russet of the plumage, especially on the pileum.

+ 11. Kittacincla malabarica macrura.

Turdus macrourus Gm., Syst. Nat. 1788, p. 820 (Pulo Condore).

3 ♂. "Iris brown, bill black, feet pale fleshy". Total length, 255, 220, 165. Wing, 94, 92, 88 mm.

Mr. Williamson's specimens of this long-wanted bird, though not forming a very good series, enable us to state that it represents a good subspecies, the males being paler on the breast than continental forms and with less black in the outer tail feathers than in any other race except *K. m. suavis* Sclater, from S. E. Borneo, which is very distinct. The subspecies is confined to Pulo Condore.

+ 12. Locustella certhiola.

Motacilla certhiola, Pallas, Zoogr. Rosso-Asiat. I, 1827, p. 509 (beyond Lake Baikal).

Locustella certhiola, Hartert, Vog. Palaarkt. Faun. i, 1910, p. 550.

1♂, 2♀. "Iris reddish brown, bill above blackish brown, below pale pinkish brown, legs pale pinkish brown". Total length, ♂ 140; ♀ 153, 150. Wing, ♂ 61; ♀ 66, 67 mm.

These specimens, evidently on migration, are all fairly adult; they have the under-surface whitish, without any tinge of yellow, the breast tinged with buffy brown and the under tail-coverts brownish, paler at the tips. The species is not uncommon on migration during the winter months in the Malay Peninsula and on small islands in the Straits of Malacca, but appears to be only a bird of passage, making a very brief stay. With us, moreover, quite young birds, which are very different in colour from the adults, are much more numerous. In these the whole under-surface is yellowish, the flanks and under wing-coverts deep brown with a yellowish tinge, and the foreneck, breast and flanks with narrow brownish black streaks.

+ 13. Orthotomus atrogularis.

Orthotomus atrogularis Temminck, Planches Coloriées, 1836, text in Livr. 101. (Malacca).

2♀ "Iris deep yellow; maxilla brown, mandible pale fleshy; feet pale fleshy". Total length, 122, 110. Wing, 46, 47 mm.

† 14. Phylloscopus borealis borealis.

Phyllopneuste borealis, Blasius, Naumannia, 1858, p. 313 (Ochotsk Sea).

1♀. "Iris dark brown, bill above brownish black, below yellow, legs brownish." Total length, 120. Wing, 64 mm.

Though one might have expected from the locality that this Willow-Warbler would prove to belong to the Chinese form, *P. b. xanthodryas*. (Swinh., P. Z. S., 1863, p. 296), the very small first primary shows that it must be referred to the typical race.

† 15. Dicrurus annectens.

Buchanga annectens Hodgson, Ind. Rev., I, 1837, p. 326 (Nepal).

1 ♂. "Iris reddish brown, bill and feet black." Total length, 275. Wing, 147. Tail, 135. Bill, breadth at nostrils 10: height at chin, 11 mm.

An undoubted example of the Crow-billed, and not of the Black, Drongo as one would perhaps have expected. The specimen is in immature plumage, considerably spotted with white on the abdomen, under wing- and under tail-coverts.

† 16. Dissemurus paradiseus malayensis.

Edolius malayensis Blyth, Journ. Asiat. Soc. Bengal. XXVIII, 1859, p. 272 (Penang).

Dissemurus paradiseus malayensis, Kloss, Ibis, 1918, pp. 229, 518.

4 ♂, 6 ♀. "Iris brown or reddish-brown, bill and feet black." Wing, ♂ 154, 157, 159, 166; ♀ 153, 155, 159, 161, 161, 165 m.m.

The wing lengths of these birds are about the same as in *D. p. paradiseus* of Central Siam, but the crests are much smaller and much less laterally compressed and curved, though more bushy. Pulo Condore birds and birds of Cochin-China are not to be distinguished from *D. p. malayensis* to which we accord a range in the Malay Peninsula from the Dindings to Mergui. The Continental Paradise-Drongos are much affected by latitude, and their crests increase in size as they go northwards. *D. p. platurus*, of the southern part of

the Malay Peninsula, has the smallest crest : then come progressively *D. p. malayensis*, with range as above, and farther northwards, *D. p. paradiseus* extending from Central Tenasserim eastwards to Annam; the doubtfully distinct *D. p. rangoonensis* occurs in the southern half of Burma, and to the east in the same latitudes is found *D. p. johni* in Hainan : largest crested of all is *D. p. grandis.* from Nepal to Yunnan.

The same thing happens in India, where *D. p. malabaricus* has a smaller crest than *grandis*, and *D. p. ceylonensis* one smaller still.

† 17. Passer montanus malaccensis.

Passer montanus malaccensis Dubois, Faun. Vert. de la Belgique, Oiseaux, I, 1887, p. 574 (Malacca).

1 ♂, 2 ♀. "Iris pale brown, bill blackish brown, feet pale brown". Total length, ♂ 125 ; ♀ 130,125. Wing, ♂ 67 ; ♀, 63, 67 mm

REPTILES AND BATRACHIANS COLLECTED ON PULO CONDORE.

By Malcolm A. Smith, f.z.s.

With 1 Plate.

The collection of reptiles and batrachians made was not large, and it seems unlikely that it fully represents the herpetological fauna of the Island. In batrachians, considering the number of small streams met with by the collectors, it is unusually poor. Two ground Geckoes were obtained which appear to be new to science, and they are here described for the first time. The type series of each form has been presented to the British Museum of Natural History.

The numbers referred to throughout are the registered numbers of my own private collection.

REPTILES.

Draco maculatus haasii Boettger.

Draco maculatus haasii, Smith and Kloss, Journ. N. H. Soc. Siam, i. p. 239 (1915).

8 specimens.

In the absence of any blue spot at the base of the gular pouch, these specimens agree with the form described by Kloss and myself from the Chantabun coast. They are, however, distinctly larger, and the consideration which we gave to size is evidently of no value. The slight difference between *D. m. haasii* and the typical form, therefore, is one of colour only, but as it appears to be confined to a definite geographical area, the name may be retained. The distribution of this form is very limited, and includes the S. E. portion of Siam and adjacent region in Cochin China. From the Dong Rek mountains (E. Siam) I have obtained both forms, but elsewhere in Siam, as well as in Southern Annam, the typical form only.

The colouration of *Draco maculatus* in life has never yet been fully described. The wing membranes above vary from orange or reddish-brown to pale yellow, yellowish-green or green. The markings are equally variable and range from a few black spots

only, to a membrane so thickly covered by them that they almost obscure the ground colour. These variations do not depend upon sex. Inner side of gular flap bright yellow, gular pouch, orange, brown, or yellow.

Gymnodactylus condorensis, sp. nov.

Snout obtusely pointed; ear opening small, vertically oval, one-third the diameter of the eye. Snout with small keeled granules, back of head with minute granules, interspersed with larger ones; rostral one and a half times as broad as high, with median cleft above, entering the nostril; supranasals small, separated from each other by a small scale; 10 or 11 upper and 8 or 9 lower labials; mental moderate, triangular; first pair of chin-shields in contact with each other and followed by a series of smaller shields; body and limbs above with small granules, intermixed with larger, rounded, subtrihedral tubercles; lateral fold from axilla to groin usually well marked; throat covered with small granules, ventrals small, cycloid, imbricate, 30-38 across the middle of the body; a group of 4-5 præanal pores and a series of enlarged scales along the under surface of the thigh; no pubic groove; tail round, covered with small flat scales; enlarged pointed tubercles in series above and broad transverse plates below.

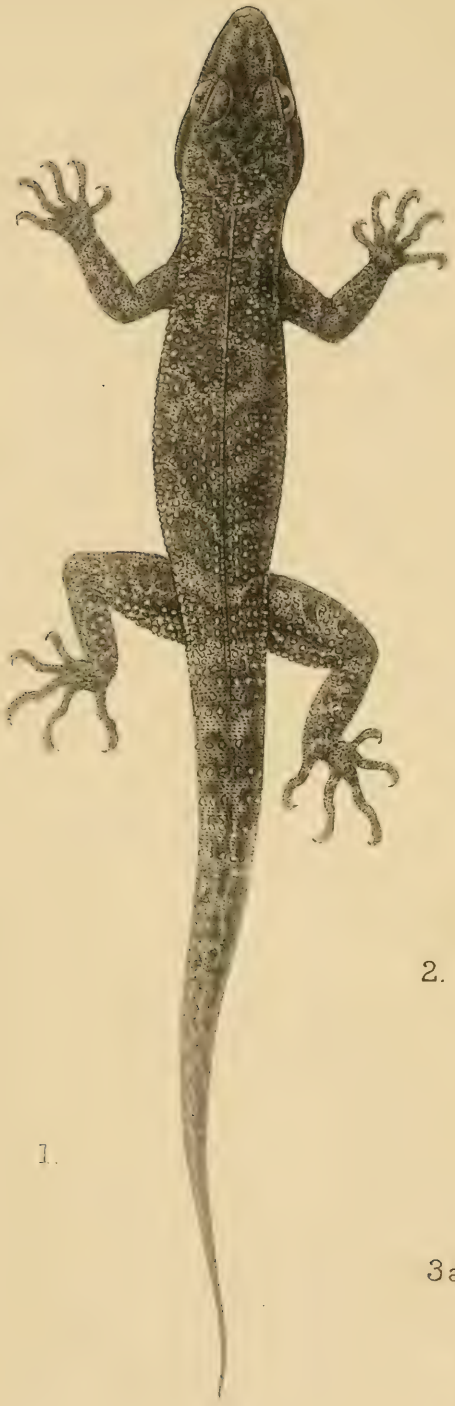
Greyish-brown above, with large dark spots usually arranged transversely across the back; a dark streak behind the eye meeting its fellow on the neck; below pale greyish.

Allied to *G. consobrinoides* Annandale, from Tenasserim.

8 specimens examined. Type series, 4023, 4024, 4027, 4030, 4031.

Measurments in millimetres.

	♂	♀
	4023	4024
Head and body	80	68
Tail	100	85
Fore limb	33	25
Hind limb (to articulation) ...	43	37



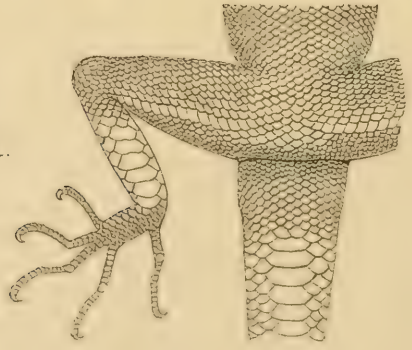
1.



2.



3.



3a.

1. 2. GYMNODACTYLUS CONDORENSIS. 3. GONATODES GLAUCUS.

Explanation of plate.

1. Gymnodactylus condorensis. (No. 4023).
2. „ „ (No. 4030).
3. Gonatodes glaucus (No. 4032).

Gonatodes glaucus, sp. nov.

Snout long and rounded, longer than the distance between the eye and the ear-opening; ear-opening vertically oval, about half the diameter of the eye; head covered with small granules, those on the snout keeled, and larger than those on the back of the head. Rostral large, twice as broad as high, with a median cleft above; nostril bordered anteriorly by the rostral, a supranasal and the 1st labial; 8-10 upper and 7-8 lower labials; mental very large, triangular, with a small azygos shield at its apex; two pairs of chin-shields, first much larger than second. Body above covered with small granules, and with enlarged tubercles on the back arranged in about ten fairly regular longitudinal series; an oblique series of tubercles passing backwards and inwards from above the tympanum, and another series parallel to it in front of the shoulder. Ventral scales cycloid, imbricate, smooth. No femoral or præanal pores; a series of slightly enlarged scales along the underside of each thigh. Tail cylindrical, suddenly constricted* after the postanal swelling; a paired series of enlarged pointed tubercles above on either side of a median groove, and enlarged transverse plates below which commence at the constriction. Limbs long, covered with small granular scales above; a series of 6-7 very large transverse scales beneath the tibia; digits long and slender, the basal portion not dilated, with enlarged, transverse scales below. The hind limb reaches the neck.

Grey above, with large black spots on the neck and shoulders, and sometimes a few, less distinct, on the back; the enlarged series of tubercles on the neck and body, whitish; below greyish-white.

I cannot discover any close ally to this new species. The possession of enlarged plates beneath the tibia appears to be unique in the genus.

49 specimens examined. Type series, 4032, 4033, 4043, 4047, 4062, 4068, 4071, 4079.

*The constriction I at first regarded as due to a reproduced tail, but as it is present in every example, I presume the character to be normal.

Measurements in millimetres.

		♂ 4044	♀ 4067
Head and body		64	60
Tail		72	86
Fore limb } to articulation	...	30	26
Hind limb } to articulation	...	43	40

Gecko verticillatus Laurenti.

2 specimens.

Calotes versicolor (Daud.).

1 specimen.

Lygosoma olivaceum (Gray).

1 adult, No. 4019. 28 scales round the body, dorsals feebly 5-carinate.

Barbour is in error in stating (Mem. Mus. Comp. Zool., xliv. (1), Nov. 1912) that the type locality of this species is on the coast of Indo-China. Prince of Wales Island referred to by Gray is no doubt the Island of Penang, by which name it was at that time known.

Tropidonotus piscator (Schneid.).

Adult ♀, No. 4013. Scale rows, 19. 17. v. 142., c. 28 (tail docked). Olive brown, with black spots arranged quincuncially. Ventrals edged with black.

Holarchus* cyclurus (Dum. & Bib.).

2 examples. Ad. ♂, No. 4015. Ttl. length, 690, tail, 140. Scale rows, 21. 19. 17. 15., v. 167., c. 54. Brown above, the edges of some of the scales coloured black so as to form an indistinct network. Head uniform brown; belly white.

Juv. ♂, No. 4016. Scale rows, 19. 21. 19. 17. 15., v., 166., c. 58. Colour as in the adult, but the black network quite distinct, and the usual generic markings present on the head and nape.

Holarchus violaceus (Cant.).

No. 4017. Ttl. length, 430; tail, 60. Scale rows, 17. 15; v. 171, c. 36. Reddish-brown above, with 37 narrow black bars on the

*The generic name *Simotes* is preoccupied for a group of Mammals. Stejneger, Herpet. Japan, p. 353 (1907).

body, and 6 on the tail. Belly powdered with grey in the posterior half, with a tendency to form quadrangular spots at the sides of the ventral scales. Head uniform brown. Tail white below.

Dryophis prasinus Boie.

Ad. ♀, No. 4011. Hf. gr. ♂, No. 4012.

The female appears to be the largest on record. It measures 1970 mm. in total length, tail 670.

Scale rows, 15. 13., v. 219., c. 166.

„ „ , 15. 13. 11., v. 229., c. 178.

Colour of both. Leaf green above, paler below; tip of tail, buff.

Chrysopelea ornata (Shaw).

Hf. gr. No. 4014. Scale rows., 17. 15. 13., v. 234., c. 138.

Colour as in Siamese examples, Boulenger's form D.

BATRACHIANS.

Oxyglossus laevis martensii (Peters).

3 examples. Nos. 4091, 2, 3.

Agree entirely with examples from Siam.

Rana erythræa (Schleg.).

1 example. No. 4020.

Bufo melanosticus Schneid.

2 examples. Nos. 4021, 4022.

ON A SMALL COLLECTION OF MAMMALS FROM CAMBODIA.

By C. Boden Kloss, f.z.s.

In 1918 Dr. Malcolm Smith's reptile collectors spent the greater part of December in Cambodia: they brought back, as usual, some well prepared mammal skins which have been referred to me for determination.

The mammals of Cambodia have been so little investigated that the specimens, though few, are worth putting on record: amongst them is what appears to be a new race of striped squirrel *(Tamiops)*.

The collectors seem first to have visited Pak Kong, i.e., the mouth of the Kong river. This, apparently, is about ten miles north of Koh Kong (the Island of Kong) and only five or six miles beyond Ok Yam, the most southerly place I collected at in 1914 (vide P. Z. S. 1916, p. 28 and map, pl. 1). They next went to "Koh Kape" (Island of Kape): this I am unable to discover, but the label on the only specimen preserved states that it is near Koh Kong. Thence they sailed southwards to Sré Umbel (which will be found on any decent map of Cambodia), and proceeding up-river, directly northwards for about twenty miles, stopped at Kompong Som. Afterwards they visited Kompong Som Bon: I cannot trace this place but it cannot be far from Kompong Som. The collection was, therefore, made in the lowlands of the Cambodian coast region.

1. Tupaia glis cambodiana Kloss.

Tupaia glis cambodiana Kloss, Journ. Nat. Hist. Soc. Siam, III, 1919, p. 357 (Klong Yai, S.E. Siam).

Tupaia concolor Kloss (nec Bonh.), P.Z.S. 1916, p. 36.

1 ♂ ad., 1 ♀ ad., Kompong Som Bon, near Sré Umbel, S.W. Cambodia. 21st-23rd Dec. 1918 [Nos 2715, 6/CBK.]. Dr. Malcolm Smiths's collector.

This race is more like *T. g. belangeri* from S. E. and S. W. Siam than *T. g. concolor* of S. Annam, differing from it in rather richer colour and less developed neck-stripes. It is much more warmly coloured than *T. g. concolor* in which the neck-stripes are practically obsolete.

These two specimens have a rather more pronounced buffy eye-ring than the original series from the southern extremity of S. E. Siam.

2. Ratufa melanopepla leucogenys Kloss.

Ratufa melanopepla leucogenys Kloss, P. Z. S. 1916, p. 43 (vicinity of Krat, S. E Siam); id., Journ. Nat. Hist. Soc. Siam, II, 1916 – 7, pp. 15, 306.

Sciurus javensis Gray (nec Schreber), P. Z. S., 1861, p. 137.

1 ♀ ad., 1 ♀ vixad., Kompong Som, near Sré Umbel, S. W. Cambodia, 13th December 1918 [Nos. 2717, 8/CBK.]. Dr. Malcolm Smith's collector.

In colour the adult exactly agrees with a paratype: the younger animal is rather more ochraceous on the fore-limbs and under parts, and there is no pronounced extension of buff over the upper surface of the hind foot which is merely slightly grizzled.

3. Sciurus ferrugineus cinnamomeus Temm.

Sciurus cinnamomeus Temminck, Esquisses Zool. Guiné, 1853, p. 250 (Cambodia).

Sciurus splendens Gray, P. Z. S. 1861, p. 137, (Cambodia).

Sciurus ferrugineus cinnamomeus Kloss, P. Z. S., 1916, p. 45.

3 ♂ ad., Pak Kong, near Koh Kong, S. W. Cambodia, 3rd Dec. 1918 [Nos. 2719 – 21/CBK.]

1 ♀ vixad., Koh Kape near Koh Kong, 7th Dec. 1918 [No. 2722 CBK.]. Dr Malcolm Smith's collector.

These represent Gray's var. 2, and do not differ from the majority of the specimens I obtained in S. E. Siam. Of *Sciurus cinnamomeus* Temminck wrote "Patrie, La Péninsule de Malacca, dans les environs de Cambodge". No red squirrel occurs in the Malay Peninsula: the type locality is therefore Cambodia.

4. Menetes berdmorei mouhoti (Gray).

Sciurus mouhotii, Gray, P.Z.S., 1861, p. 136 (Cambodia).

Menetes berdmorei mouhoti, Kloss, Journ. Nat. Hist. Soc. Siam, III, 1919, p. 372.

1 ♂ ad., Kompong Som, near Sré Umbel, S. W. Cambodia, 16th Dec. 1918 [No. 2725/CBK.]. Dr Malcolm Smith's collector.

No median dark dorsal stripe and the lateral ones barely in-

dicated; pale stripes buffy, sides between them a grizzle of black and brown; under parts white suffused with buffy, strongly on abdomen and thighs.

Practically a topotype.

5. Tamiops macclellandi dolphoides, subsp. nov.

2 ♀ ad., Kompong Som Bon, near Sré Umbel, S.W. Cambodia, 21st Dec. 1918 [Nos 2723, 4/CBK.]. Dr Malcolm Smith's collector.

Like *T. m. rodolphi* (A. M.-Edw.) of Eastern Cochin-China but paler, less richly coloured throughout except for the tail which is similar.

The upper parts, including the yellow stripes, less suffused with ochraceous or tawny, the hands and feet paler buff. Under parts and inner sides of limbs antimony-yellow instead of ochraceous-orange: lips and chin whitish buff.

The interruption across the shoulders of the outer pair of pale stripes distinguishes this animal from the form occurring in South Eastern Siam.*

Type. No. 2723/CBK.

I have ventured to name these examples, though they may only represent a seasonal colour phase of *T. m. rodolphi*; but I do not think that animals from so far south in the Indo-Chinese Peninsula undergo such a change of colour.

6. Rattus rajah finis Kloss.

Epimys surifer finis Kloss, P. Z. S. 1916, p. 51 (Klong Menao, S. E Siam).

1 ♂ ad., 1 ♂ vizad., Kompong Som, near Sré Umbel, S. W. Cambodia, 16–18th Dec. 1918 Nos. 2726, 7, 9/ CBK.].

1 ♂ ad., Kompong Som Bon, near Sré Umbel, 23rd Dec. 1918 [No. 2728/CBK.]. Dr. Malcolm Smith's collector.

Typical specimens of this race of clay-backed white-bellied forest rat.

**Tamiops macclellandi liantis* Kloss, Journ. Nat. Hist. Soc. Siam, III, p. 370. Dec. 1919 (Sattahip, near Cape Liant).

Tamiops lylei Thomas, Ann. & Mag. Nat. Hist (9), V, p. 307. March 1920 (Sea-coast, 50 miles south of Bangkok).

7. Tragulus kanchil affinis Gray.

Tragulus affinis Gray, P.Z.S, 1861, p. 138 Cambodia.

Tragulus kanchil affinis, Kloss, P. Z. S. 1916, p. 63.

1 ♀ ad., Kompong Som, near Sré Umbel, S. W. Cambodia. 16th Dec. 1918. [No. 2730/CBK.]. Dr. Malcolm Smith's collector. Head and body, 400; tail, 65; hindfoot, c.u., 112; ear, 34. Skull: greatest length, 92; greatest breadth 45 mm.

Practically a topotype.

TWO NEW RACES OF SCIURUS FINLAYSONI

BY C. BODEN KLOSS, F. Z. S.

Examination of a series of "white" squirrels from practically the type locality of *Sciurus finlaysoni tachardi* (Robinson),[1] which the collector of the type, Mr. T. H. Lyle, C.M.G., informs me is in North Siam on the Nam Nan, some 30 miles north-east up river from Utaradit, towards the mouth of the Nam Pat, convinces me that at some period, or season, this race assumes a wholly or partial bay pelage. Animals which do not undergo this change must be regarded as distinct subspecies and I recognise the following additional continental forms:—

1. Sciurus finlaysoni prachin, subsp. nov.

Sciurus finlaysoni, Kloss, Journ. N. H. S. Siam, II, pp. 16 30 (1916).

Pelage always rich creamy: only the concealed bases of the hairs grey.

Type. Adult male from Krabin, Central Siam, obtained by Messrs. E. G. Herbert and Malcolm Smith's collectors on 11 Nov. 1915. No. 2048/CBK.

Specimens examined. Five from the type locality and one from Chanteuk, Eastern Siam.

For measurements (external dimensions taken by native collector) and further details see reference cited above.

2. Sciurus finlaysoni rajasima, subsp. nov.

Sciurus finlaysoni finlaysoni, Kloss, Journ. N.H.S. Siam I, 1915, p. 225 (Lopburi).

Sciurus finlaysoni, id. op. cit., II, 1916, pp. 83, 87 (Pak Jong).

Sc. finlaysoni tachardi, id. op. cit., III, 1919, pp. 368, 401, (Lat Bua Kao).

Pelage creamy but with the grey basal portions of the hairs so increased that the general appearance on the upper surface of head, body and limbs is often that of a greyish animal with cream-tipped hairs. *Type.* Adult female from Lat Bua Kao, E. Siam, collected by C. Boden Kloss on 10 October, 1916. No 2132/CBK.

1 *Callosciurus finlaysoni tachardi* Robinson, Journ. F. M. S. Mus., VII, p. 36 (1916).

Specimens examined. Fifteen from the type locality, one from Pak Jong, E. Siam, and two from Lopburi, Central Siam.

For measurements and further details see references cited above.

The relationships of many Indo-Chinese squirrels are very difficult to trace.

S. f. prachin is only a large mainland form of the little island race *S. f. finlaysoni* which perhaps, through *S. f. rajasima*, is doubly linked up with the small greyish grizzled island animals *S. f. folletti* and *S. f. trotteri* which certainly belong to the species. Through the last of these there may be connection with the large black *S. albivexilli*, with white-tipped tail, of Koh Kut; and thence to the wholly black animals, the large *S. nox* of the mainland and the little *S. germaini* of Pulo Condore. Still further the coloured phase of *tachardi* may show that the *ferrugineus* group of squirrels are only really races of *finlaysoni*.

No. I. A Habitat of Schomburgk's Deer (*Cervus schomburgki*).

In a paper by Major E. Seidenfaden in Volume XIII of the Journal of the Siam Society, the following passage occurs (Part 3, May 1920, pp. 49, 50):—

"In 1919 I met several hunters from Amphö Pu Kio (now called Pak Bang) who told me that a tribe called *Khā Dong Lüang* (the withered leaves' savages) or *Khā Tam Bang* (the savages who can make themselves invisible) lived in the jungle on the slopes of the big Pu Kio mountain, which to the west separates Amphö Pak Bang from the Petchabun changvad. These Khā are under middle height, well built, but very dark hued; their hair is lank and straight as that of mongoloid races, not curly as that of negroids; both sexes go entirely naked; they do not construct houses but live under some hastily erected leaf shelters like the Semang; and they leave these shelters, after some few days (hence the name Khā Dong Lüang). Their only weapon is a sort of wooden javelin, the point of which is hardened in fire; they are courageous and able hunters and chase and kill both the one-horned and the two-horned rhinoceros (Kaso), the sladang or Kating ox, deer and wild pigs and that rare animal, Schomburgk's deer, which is living just in this region."

This locality is either within, or very near, the area to which Mr. P. R. Kemp considers *Cervus schomburgki* to be restricted (Journ. N. H. S. Siam III, p. 7), and helps us towards a more definite knowledge of its habitat.

The Journal of the Siam Society is not commonly consulted by zoologists, and the passage is of sufficient interest to have their attention called to it.

C. Boden Kloss.

December, 1920.

No. II. The status of the Burmese House-Crow (*Corvus splendens insolens*) as a Siamese Bird.

Oates, in writing of *C. insolens* [Handbook Birds Brit. Burmah (1883) I, p. 399], remarks that "It has been sent from Siam, where it is probably abundant; and Dr. Tiraud states that this species is the common House-Crow of Cochin China." The same author [Fauna Brit. India, Birds I (1889), p. 21] observes that "This species extends into Siam and Cochin China."

The next reference which I can trace is that of Gyldenstolpe [Kungl. Sv. Vet. Akad. Hand., Band 50, No. 8. (1913), p. 18] who says of *Corvus insolens*:—"Very common in Bangkok and its

neighbourhood, but I failed to observe it in Northern Siam, though it possibly occurs round the towns and villages with the Jungle-Crow. In real jungles, however, it is always replaced by *Corvus macrorhynchus* Wagl."

Gyldenstolpe was, of course, in error in stating that this bird is very common in Bangkok and its neighbourhood, as I pointed out in Part I of my Paper on the Birds of Bangkok in the Journal of this Society, Vol. I, No. 2, page 76 (1914). I remarked then that I had never seen the bird here.

Finally, Gyldenstolpe in "A Nominal List of the Birds at present known to inhabit Siam" (Ibis, 1920, p. 448), observes:— "In the British Museum (Natural History) there is a specimen collected by Mouhot in Siam. Also observed in Bangkok by the present author."

Some years ago Mr. K. G. Gairdner informed me that he had seen this bird at Petchaburi, a town about 150 km. south-west of Bangkok on the Southern line of railway, and the Rev. Lucius C. Bulkley, of Petchaburi, states (in a letter just received) that he has always understood that the Burmese House-Crow was found at Ratburi — 101 km. west of Bangkok, on the same line. Both these towns are in the Province of Rajaburi. I am not aware of the locality where Mouhot obtained his specimen, but as he spent four months in Petchaburi Province in 1860, it may well be that he procured it there.

In the Bangkok Museum there are two mounted specimens, in an excellent state of preservation, with a label giving the Latin and English names, but no date—the handwriting being said to be that of the late Dr. E. Haase, Scientific Director of the Museum, who died in Bangkok in 1894. The taxidermist of the Museum, Khun Bamrung (ขุนบำรุง), informs me that he himself shot the birds at Pran, in S. E. Siam, 235 km. from Bangkok on the Southern line, and about 85 km. south of Petchaburi. The year, he states emphatically, was that of the "trouble with the French," *i.e.*, 1893, when a French Inspector of Police was shot on the Mekong, and two French gunboats forced the passage of the Menam Chao Phya (the river on which Bangkok stands) after a skirmish with the forts at the mouth of the river. This date coincides well with that of the death of Dr. Haase, who was succeeded at the Museum by Capt. Stanley S. Flower.

The position appears, therefore, to be that three authentic Siamese specimens of the Burmese House-Crow are on record—one obtained by Mouhot about the year 1860, now in the British Museum in London, and two collected by Khun Bamrung, the taxidermist of the Bangkok Museum about the year 1893, and still

in that institution, mounted and exhibited in a case. I have handled these specimens. Certain it is that the bird is now very rare in Siam, and has not been procured by any recent collector. Pran, the place where the two specimens in the Bangkok Museum were procured, is only 19 km. south of Nong Kae, on the same line, where I collected for a week in December 1917 without seeing a sign of this bird.

The Siamese name for the Burmese Jungle-Crow *(Corvus coronoides andamanensis)** is Kā (กา), while they know the Burmese House-Crow as Kae (แก) – both words being, of course, onomatopœic, as are so many Siamese names of birds. Nong Kae (หนองแก), the place mentioned above, means "The swamp of the Kaes", so the bird must have been found there once.

W. J. F. Williamson,

December, 1920.

CORRIGENDUM.

P. 106, line 23. *For* Petchaburi Province *read* Petchaburi district

* In adopting Beavan's name I follow Stuart Baker in his "Hand-List of the Birds of India"—Journ. Bo. Nat. Hist. Soc., xxvii No. 2 (1920), p. 230. It is to be noted, however, that Gyldenstolpe (Ibis, 1920, p. 448), has accepted the name given by Stresemann (*C. c. hainanus*) as applying to the Siamese form. In its wide sense the bird is, of course, *C. macrorhynchus* auct.

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ON PLANTS FROM SOUTH ANNAM

BY

MESSRS. E. G. BAKER, S. MOORE, A. B. RENDLE, H. N. RIDLEY AND H. F. WERNHAM.

With an introduction by the collector,

MR. C. BODEN KLOSS.

PREFACE

BY

DR. A. B. RENDLE. F. R. S.

The collection of plants made by Mr. C. Boden Kloss, in the South-east corner of Annam, in March, April and May, 1918, has been determined by members of the Department of Botany, British Museum (where the specimens are preserved), and Mr. Ridley. Mr. Kloss has supplied an account of the localities in which the plants were collected, mainly the highlands of the Langbian province; and also records of colour [1], which are printed between inverted commas. The collection presented by Mr. Boden Kloss to the Natural History Museum comprises 191 species of flowering plants, including one Gymnosperm, *Dacrydium elatum*, and 4 Cryptogams. There are 60 Monocotyledons, 33 of which are Orchids, and among these are a new genus, *Zetagyne*, near *Pholidota*; six new species and a new variety. Three of the six members sent, in the family Zingiberaceæ, are also new species; and there is a new *Smilax*. Of the 131 Dicotyledons the best represented families are Rubiaceæ, 13 species, and Compositæ, 20 species, with six new species in each. Altogether there are 39 new species, including two new genera and 4 new varieties. The majority of the novelties come from the

1 Omitted by Mr. Moore.

Langbian Plateau, at altitudes of from 5,000 ft. (at Dalat) to 7,500 ft. (Langbian Peaks); a few were collected on the Dran Plateau at 3–4,000 ft. *Cyclacanthus*, a new genus of Acanthaceæ comes from the coastal plain at Tour Cham, where also was collected a new Asclepiad, *Toxocarpus Klossii*.

Including the 43 novelties the endemic forms number 54, or thirty per cent of the whole; several are Orchids previously collected in the same locality by Micholitz. Sixteen species were previously known from Cambodia, Siam, or some other part of the Burmese Peninsula; the Zingiberaceous genus *Geostachys*, hitherto known only from the Malay Peninsula, is extended in distribution by the new species *G. annamensis*. Twelve species are Himalayan, and a similar number Indian, extending in a few cases to further India and the Malay Peninsula. Thirty-two species, or about one-sixth of the whole, are Indo-Malayan, and 4 are Malayan. *Eriocaulon Hookerianum* has hitherto been found only in Borneo and the Malay Peninsula. Twenty-four per cent of the whole are more widely distributed tropical or sub-tropical species, including, as for instance among the Compositæ, a number of common tropical weeds. The Cryptogams include a new species of fern, *Adiantum Klossii*.

INTRODUCTION

BY

C. Boden Kloss, F.R.G.S., F.Z.S.

During the spring of 1918 I spent some time in South Annam, French Indo-China, and though not primarily concerning myself with plants, succeeded, in the intervals of other collecting pursuits, in bringing together the material dealt with below. My visit, in company with Dr. Malcolm Smith, was made during the second half of the dry season which is not the best time for gathering botanical specimens, as in some of the districts where our camps were made vegetation was much dried up. When I came away towards the end of May the rains had just started; the country was beginning to look greener and many plants were showing signs of budding: this time would apparently be the best for a botanist's visit to commence; he would not experience the pleasantest

weather, which is during the cool season, but would probably enjoy the most favourable conditions for furthering his objects.

The collection secured contains practically all the species in flower that I met with round our camps, and was made between Phanrang, on the coast of South Annam in Lat. 11° 35′ N., and the Langbian Peaks, 7,500 ft. (in the hill province of Langbian which contains almost all the southern extremity of the Annamite mountain chain), distant from Phanrang about fifty miles in a NW ½ N direction.

The places from which specimens came are:—

1. Tour Cham, Phanrang Province: on the coastal plain four miles from Phanrang. The country in the neighbourhood is covered with short grass and scattered thorny bushes, many with succulent leaves: it has a superficial resemblance to much South African scenery and is very sterile except where irrigated for rice. (Specimens collected in March and May).

2. Daban, Phanrang Province: about thirty miles NW ½ N from Tour Cham. Situated within the lower spurs of the mountain range at a height of 650 ft. The locality is mainly clothed with forest, tropical, but very different from dense equatorial jungle owing to the scantiness of undergrowth and the absence of parasitic plants and lianas: very dry except along the banks of the Kronfa river and largely very rocky. In March while I was sojourning there the prevailing tints of the foliage were yellow and pink and the ground was covered with dry leaves; but in May, when I passed by again, all the vegetation had become a beautiful fresh green. (Specimens collected in March).

3. Dran, Langbian Province; about twelve miles from Daban and up in the mountains at 3,000 ft. on a broad shelf or plateau through which the Da Nhim (river) runs to join the Donai. The first pines were seen at 2,700 ft., and at 3,000 ft. and higher they predominate in grass-land, though green and denser non-coniferous forest also occurs. The pine-woods consist principally of *Pinus Khasya* with a small proportion of *Pinus Merkusii* and a few solitary trees of *Thuya* sp.; corky-barked oaks grow also among

the pines on the ridges and afford support to the common scarlet and white orchid, *(Dendrobium draconis)*, at 4,000 ft. and higher. Some of the plants obtained round Dran came from swampy spots; some others were collected along the road-side, and of these part have probably been brought up through the construction of the road which is now being made from Daban. (Specimens collected in March and May).

4. Arbre Broye, 5,400 ft., and Le Bosquet, 5,200 ft., Langbian Province, are on the way from Dran to Dalat; the route is mainly through pine-forest and grass-land though there are some stretches of leafy jungle also. A few plants were obtained during the journey out and back in March and May. At the latter time a good many things not noticed on the way up were in flower between these two places, no doubt the result of recent rain; at Arbre Broyé I saw on a tree a charming white clematis with a brown and yellow centre. No collecting could be done as my supply of paper had come to an end.

5. Lian Khanh, Gou Gah, Tambor, and Tambou are all between Dalat and Djiring, 3,000 ft., about thirty five miles to the south-west of the former. A flying visit was paid to Djiring in April: the route runs over slightly undulating country, between 2,700 and 3,200 ft. in height, through various kinds of forest, scrub and grass-land.

6. Dalat, 5,000 ft., in Langbian Province, is about twenty-one miles N. W. of Dran. It is situated near the south-western edge of the Langbian Plateau, the centre of which is an undulating area of treeless grass-land surrounded by pine and oak forest with undergrowth of grass and bracken: there are also some patches of mixed forest. The open country is about eight miles by five in extent and at the New Year the grass, then three or four feet high, is regularly burnt by the Moi (as the Indonesian inhabitants of the hills are called by the Chinese Annamites). This burning, which spreads to the forests also, destroys all seedling trees and is probably the cause of the open area, though now the indigenous population in the immediate neighbourhood is very small. (Specimens collected in April and May).

7. Langbian Peaks. 7,500 ft., situated at the north-eastern extremity of the Plateau. The massif is roughly crescentic in form, and the hollow side, facing Dalat, is clothed below the central and higher summits with mixed forest, very open beneath, which becomes small and dense near the ridges and on the two highest peaks, which are adjacent to each other. The eastern ridges are covered with oaks, while pines and grass-land predominate on the outer slopes and on the western arm of the range. I met in this locality only one species of Rhododendron and one very unornamental Begonia (*B. langbianensis* Bak. fil., sp. nov.); but, unfortunately neither was in flower. (Specimens collected in April).

The flora was largely new to me, and as I am no botanist but took practically everything I saw in blossom at each place during the periods of my visits, I shall not attempt to record the occurrence at the various collecting stations of species not in flower. Ferns were very scarce.

The temperatures experienced varied from 65° F. in the early mornings and over 90° in the shade in the afternoons at Tour Cham and Daban to about 52° at sunrise and 65° on dull afternoons in our camp at 6,000 ft. on the Langbian Peaks. The weather was very dry until the third week in April, but subsequently a good deal of rain fell in the hills after midday.

The rainy season at Dalat is from April to October and this is also the period of most equable temperature. The dry season lasts from mid-November to mid-April, and though the nights are considerably colder than in summer, the days, on the other hand, are hotter. In February three or four degrees of frost sometimes occur, and in that month and March the diurnal range of temperature may be between 30° and 90° F., whereas in August and September it is between 50° and 80°. The winter season is much the pleasanter time for a visit.*

*For another account of my visit, with a sketch map showing route and localities, and plates of scenery and vegetation, see "Ibis", July 1919, pp. 392-402, text-figure 3, pls. VII-IX. Note that the upper illustrations on pls. VII and VIII have been misplaced: the upper picture on pl. VIII goes with the upper legend on pl. VII, while the upper picture on pl. VII is a photograph of the Langbian Peaks and Plateau.

The general aspect of the Langbian hill region is probably very like that of the Shan States. The pine woods which extend to fifteen or twenty miles south of Djiring belong to the most southerly forests of this kind in continental Asia.

It is sometimes stated, even as recently as 1913 (cf., Groom and Rushton in Journ. Linn. Soc., Bot., XLI, pp. 458,484), that *Pinus* occurs in the Malay Peninsula. This is not known to be the case even if we consider this peninsula to commence, as we must if we want to be accurate, at the head of the Gulf of Siam, i.e., in lat. N. 13° 30′.

Pines are not recorded from Mt. Nwalabo near Tavoy in Southern Tenasserim and are therefore unlikely to occur on Mt. Myengmolekhat, 6,800 ft., a little further south and just within the peninsular area.

The species of *Pinus* and their distribution in Southern Indo-China and the adjacent archipelago are:—

Pinus Khasya North Tenasserim (Martaban); North Siam (Chiengmai District); Annam.

Pinus Merkusii North Tenasserim (Martaban; Salwin and Thoungyin rivers); North Siam (Chiengmai district); Annam; Cochin China;* Philippines (Luzon and Mindoro); South-eastern Borneo; North Sumatra.

Pinus insularis Philippines (Luzon); Timor.

Under the circumstances the absence of *Pinus* from Java is remarkable.

MONOCOTYLEDONS.

ORCHIDACEAE

BY

H. N. Ridley, C. M. G.; F. R. S.

1. Dendrobium secundum Wall.

Dran, 3–4,000 ft. "Crimson with orange lip, no leaves."

Distrib. Cochin China, Martaban, Malay Peninsula, Sumatra, Java.

*Not indigenous; but introduced from Annam.

2. Dendrobium Williamsoni Day & Rchb. fil.

Langbian Peaks, 6000 ft. "Whitish to pale yellow, lip streaked scarlet, top of throat carmine." Dalat, 5000 ft. "Flowers yellow, hairy part of lip and base of hood blood-red, 2 to 4 flowers in a cluster."

Distrib. Assam, Khasiya.

3. Dendrobium draconis Rchb. fil.

Dran, 3–4,000 ft. "Flowers white, lips striped vermilion becoming yellowish in front." Flowers in clusters of 2–6.

Distrib. Tenasserim, Siam, Cochin China.

4. Dendrobium Pierardi Roxb.

Dran, 3–4,000 ft. "Sepals white faintly tinged green and tipped faint crimson. Petals white faintly tinged green. Lip pale yellowish green, throat streaked with purple."

Distrib. Himalayas, Bengal south to Tenasserim and Malay Peninsula.

5 Cirrhopetalum maculosum Lindl.

Langbian Peaks at 6,000 and 6,500 ft. "Dull greenish yellow spotted brown to dull pale crimson, greenish slightly marked with reddish brown."

Distrib. Nepal, Kumaon, Sikkim.

6. Ione annamensis Ridl., sp. nov.

Rhizoma validulum, pseudobulbis remotis curvis conicis flavis rugulosis (in sicca) 2.5 cm. longis 1 cm. latis ad bases. *Folium* lineari-lanceo-laterae coriaceum obtusum minute bilobum, basi in petiolo 1 cm. longo attenuatum, 12 cm. longum, 1–5 cm. latum. *Scapus* gracilis 30 cm. longus, vaginis ad 6, remotis 3 cm. longis. *Racemus* 6 cm. longus floribus nutantibus 6. *Bracteae* lanceolatae subscariosae 1 cm. longae appressae. *Pedicelli* graciles 1.5 cm. longi. *Sepalum* pasticum ovatum obtusum 1.2 cm. longum 7 mm. latum, lateralia angustiora sublanceolata aequilonga basi connata. *Petala* ovata obtusa minute denticulata 3-nervia multo breviora. *Labellum* carnosum basi cymbiforme, apice crasso minute papilloso, 8 mm. longum, kermesinum marginibus ad basinvidetur viridulum; callo ad basin transverso cornubus 2 minutis. *Columna*

flava sepalo postico adnata, stelidiis parvis augustis recurvis. *Pollinia* globosa. *Capsula* obconica 1 cm. longa.

Langbian Peaks, 6,000–7,500 ft. "Dull pale green to dull pale crimson streaked dark crimson."

Allied to *I. paleacea* Lindl., of the Himalayas, but with shorter sepals and petals, and shorter lip with upcurved sides and a very different callus at the base.

7. Eria paniculata Lindl.

Langbian Peaks, 6,500 ft. "Greenish and yellowish white blotched with crimson." This form differs from typical *E. paniculata* in its long narrow lanceolate subulate bracts .7 mm. long.

Distrib. Sikkim, Assam.

var. angustifolia Ridl. var. nov.

Caulis. 11 cm. longus, foliis carnosioribus angustioribus 14 cm. longis 3 mm. latis. *Racemus* ut in typo sed callis in labello multo longioribus. Dalat 5,000 ft. "Flowers pinkish crimson white." A somewhat similar form but more intermediate between this and the last was collected in Laos by Micholitz; the very narrow stiff leaves, and the stronger developed calli on the lip, which is purple in the centre of the terminal lobe, are distinguishing marks.

8. Eria globifera Rolfe.

Langbian Peaks, 6,000 ft. "Lip yellow streaked brownish, throat much streaked with crimson." This specimen has remarkably large flowers, the sepals 3–5 cm. long, .5 mm. across. The type plant, however, with smaller flowers, came from the same locality.

9. Eria nivosa Ridl., sp. nov.

Caules lignosi 3–5 cm. longi. *Folia* carnosa linearia 10 cm. longa 3 mm. lata, canaliculata. *Racemus* terminalis 8 cm. longus omnino albo-lanatus, floribus ad 6, pedicellis 3–4 mm. longis, bracteis ovatis subæquilongis. *Sepalum* posticum oblongum obtusum .5 mm. longum; lateralia triangularia aequilonga, .4 mm. lata, ad basin extus lanata intus glabra vel parce lanata. *Petala* linearia breviora obtusa sparse lanata; *Labellum* carnosum oblanceolatum obtusum apice incrassata, in medio depresso, carina brevi in ungue, callo oblongo papilloso in medio, marginibus minute ciliatis; *Columna*

brevis; *Anthera* ovoidea breviter apiculata.

Dalat, 5,000 ft. "Yellow; Lip crimson-brown, stem and buds and back of flower silvery to greenish." Allied to *Eria pannea* Lindl, but with a longer stem, narrower leaves, more and smaller flowers and a quite different lip.

10. Eria tomentosa Hook. fil.

Dran, 3–4,000 ft. "Brown; bracts ochraceous." A spike of flowers in bud appears to be this species.

Distrib. Silhet, Chittagong, Tenasserim.

11. Eria amica Rchb. fil.

Langbian Peaks, 6,500–7,500 ft. "Flowers pinkish white spotted purple; lip yellow; white blotched with yellowish and crimson in centre.

Distrib. Himalayas, Assam.

12. Acanthephippium striatum Lindl.

Langbian Peaks. "White tinged yellowish faintly streaked with crimson, lip spotted with deep crimson."

Distrib. Sikkim, Nepal.

13. Phaius Wallichii Lindl.

Dalat, 5,000 ft. "Flowers crimson brown and white. 5 to 6 ft. tall."

Distrib. Sikkim through Burmah to Malay Peninsula.

14. Cœlogyne Lawrenciana Rolfe.

Dalat, 5,000 ft. "Flower cream, upper side of mouth orange." Originally collected by Micholitz in this district.

15. Cœlogyne Mooreana Rolfe.

Langbian Peaks, 6,500–7,500 ft. "White lip blotched orange; Corolla pale yellow." Originally collected at this spot by Micholitz.

16. Cœlogyne annamensis Ridl., sp. nov.

Rhizoma crassum, vaginis coriaceis tectum, pseudobulbis oblongo-conicis 5 cm. longis. *Folia* lanceolata acuta, basi in petiolo alato angustata, 20 cm. longa 4.5 cm. lata; petiolo 7 cm. longo. *Scapus* in apice pseudo-bulbi 30 cm. longus. *Racemus* flexuosus 14 cm. longus parte leasali bracteata, 7 cm. *Pedicelli* cum ovariis

1 cm. longi. *Sepala* oblonga lanceolata acuta 2 cm. longa 5 mm. lata. *Petala* angustiora lanceolata acuminata .2 mm. lata. *Labellum* 2 cm. longum, lobis lateralibus oblongis obtusis; epichilio 1.5 cm. longo obtuso, marginibus denticulatis. *Labellum* 2.2 cm. longum, lobis lateralibus latis rotundatis denticulatis, epichilio oblongo-ovoideo obtuso margine denticulato, nervis elevatis 3 a basi usque ad epichilium currentibus processubus conicis elevatis in seriebus 2 vel pluribus. *Columna* arcuata, clinandrium margine brevi bilobo rotundato. *Anthera* conica.

Langbian Peaks, 6,500 to 7,500 ft. "White, lip blotched orange and yellow."

17. Sigmatogyne Pantlingii Pfitzer.

Langbian Peaks, 6,500 ft. "Flowers pinkish yellow. Leaves bronze green, bulbs yellowish. Leaves and bulbs green."

Distrib. Assam. Also collected by Micholitz on Langbian.

In the original drawings of this plant 3 small calli are shown on the lip, the middle one very small and nearer the base. This middle one does not occur in Kloss's specimens which otherwise exactly resemble the type.

18. Pholidota convallariæ Hook. fil.

Langbian Peaks, 7,000 ft. "White."

Distrib. Khasiya, Tenasserim.

Zetagyne Ridl. gen. nov.

Pseudobulbi globosi; approximati. *Folia* synanthia 2 linearilanceolata, vaginis ad basin ovatis coriacies. *Scapus* gracilis brevis. *Bracteae* cymbiformes persistentes. *Flores* mediocres, pauci. *Sepala* lanceolata acuminata carinata. *Petala* angustiora. *Labellum* integrum late lanceolatum basi saccatum gibbosum, nervis 3 elevatis. *Columna* breviuscula sigmoidea, basi incrassata, margine clinandrii elevato oblongo truncata. *Anthera* lata ovata rotunda. *Rostellum* latum crassum rotundatum. *Stigma* magnum margine crasse dilatato. Species 1.

19. Zetagyne albiflora Ridl., sp. nov.

Pseudobulbus 2 cm. longus, caules foliacei 1.5 cm. bracteis ovatis nervosis. *Folia* 3 cm. longa .5 cm. lata subobtusa, basi in

petiolo angustata. *Scapus* terminalis gracilis 4 cm. longus basi nudo. *Bracteæ* distichæ distantes coriaceæ cymbiformes acutæ .5 mm. longæ. *Pedicelli* vix longiores. *Sepala* .8 mm. longa alata. *Petala* subsecunda haud alata. *Labellum* petalis aequilongum late lanceolatum acutum integrum. *Columna* brevis.

Langbian Peaks, 6,500–7,500 ft. "Flowers white."

This little plant has exactly the habit of *Panisea parviflora* Lindl., but differs entirely in the form of the column which suggests that of some species of *Platyclinis* or *Pholidota*. It is short and sigmoid, with a tall oblong truncate hood to the clinandrium nearly as long as the rest of the column and much overtopping the anther. The rostellum is very prominent and thick, and the stigma cup-shaped with a thick edge. The sepals have a strong thin wing or keel running along the back.

20. Otochilus porrecta Lindl.

Langbian Peaks, 6,000–7,000 ft. "White blotched brown lip; *Columna* greenish brown."

Distrib. Himalayas to Tenasserim.

21. Calanthe velutina Ridl., sp. nov.

Rhizoma validulum. *Folia* ovata, apice subacuminato, superne glabra subtus hirtula, nervis prominulis ad 7, 18 cm. longa, 9 cm. lata; petiolo 30 cm. longo. *Scapus* 26 cm. longus hirtulus; flores ad 8. *Bracteae* lineares acuminatæ .7 mm. longae; pedicelli 1 cm. longi omnes hirtuli. *Sepala* ovata acuminata cuspidata 1.2 cm. longa. *Petala* ovata subobtusa glabra breviora aequilata. *Labellum* sepalis aequilongum, puberulum obcuneatum integrum, basi angusto, callis 2–4 brevibus semiellipticis ad basin calcare brevi crassiusculo uncato .5 mm. longo.

Langbian Peaks, 6,500 ft. "Flowers white. Lip streaked ochreous."

This has the habit of *C. alismaefolia* Lindl., but with an entire lip. The underside of the leaf and inflorescence is covered with very short hairs.

22. Arundina speciosa Bl.

Dran, 3,000–4,000 ft., Lian Khanh Falls, 3,000 ft. "White,

throat spotted purple; bottom of lip yellow, edges yellowish." The tip of the lip is however distinctly pink.

Distrib. India, Malay Peninsula, Java, China.

23. Cymbidium lancifolium Hook.

Dalat, 5,000 ft. "Flowers white or pinkish white. Striped deep crimson, hood tipped yellow. Ground orchid with coarse roots, no bulbs."

Distrib. Himalayas, Malay Peninsula, Java, China, Japan.

24. Vanda Micholitzii Rolfe.

Gou Gah Falls, 2,900 ft. "White becoming pale green at extremities of petals. Leaves alternate and opposite." First obtained at Langbian by Micholitz.

25. Vanda Watsoni Rolfe.

Langbian Peaks, 6,000–7,000 ft. "White slightly tinged with pink, base of lip orange and yellow. Leaves green spotted crimson." Also previously collected by Micholitz.

26. Renanthera Imschootiana Rolfe.

Dran, 3,000–4,000 ft. "Upper sepal and petals dull reddish yellow spotted crimson, throat white. Column white; lower sepals crimson, reverse salmon red. Stems red."

Distrib. Assam and Burma.

27. Saccolabium calceolare Lindl.

Langbian peaks, 6,000–7,000 ft. "Yellow blotched with red, fringe of lip white."

Distrib. Himalayas, Assam.

28. Saccolabium Klossii Ridl., sp. nov.

Caules erecti 14–18 cm. longi; vaginis valde rugosis 1 cm. longis. *Folia* linearia carnosa inaequaliter biloba obtusa 8 cm. longa .7 mm. lata. *Racemi* plures multiflori densi 4 cm. longi. *Bracteae* persistentes 3 mm. longæ. *Flores* rosei .5 mm. longi, pedicellis .5 mm. *Sepala* ovata obtusa lateralia carinata. *Petala* late ovata rotundata. *Labellum* lateribus ad basin involutis, epichilio brevi acuto ovato cymbiformi callo v–formi ad basin. Calcare crasso in medio attenuato apice subgloboso dilatato. *Pollinia* oblongo–rotundata, pedicello brevissimo lata, disco oblongo quadrato quam

pedicellus multo majore. *Capsula* ellipsoidea ad basin angustata .5 mm. longa.

Langbian Peaks, 6,000–7,500 ft. "Pale crimson, spur white."

Allied to *S. rubescens* Rolfe, of the same district, but the flowers are much smaller, and the spur is pinched in before the globosely dilated tip.

29. Saccolabium Eberhardtii Finet.

Langbian Peaks, 6,000 ft. "Pale crimson." This was the original locality of the species.

30. Saccolabium gemmatum Lindl.

Dalat, 5,000 ft. "Deep crimson, lip white."

Distrib. Himalayas.

31. Thrixspermum fragrans Ridl., sp. nov.

Folia lorata biloba 16 cm. longa 1.5 cm. lata. *Racemus* 2 cm. longus, bracteis cymbiformibus remotis 4 mm. longis. *Flores* ad 4; pedicellis gracilibus .5 mm. longis. *Sepala* et *petala* lanceolata caudata augusta 1.5 cm. longa. *Labellum* saccatum, lateribus elevatis apice subulato, 1 cm. longum, calcare oblongo linguiforme truncato in ore. *Columna* pede sepalis unita, marginibus elevatis involutis.

Dran, 3,000–4,000 ft. "Flowers white tinged yellowish with strong scent of tuberose. Leaves alternate. Roots greyish green."

Allied to *Th. notabile* Ridl., but the leaves much larger and a callus in the mouth of the spur.

32. Spiranthes australis Lindl.

Dalat, 3,000 ft. "Flowers pink."

Distrib. Tropical and subtropical Asia except Malay Peninsula, Australia, New Zealand.

33. Cypripedium villosum Lindl.

Langbian Peaks, 7,000 ft. "Dull waxy yellow, washed and veined with reddish brown. Lip green veined darker, its centre chocolate and edges whitish."

Distrib. Tenasserim.

ZINGIBERACEÆ.

BY

H. N. RIDLEY.

34. KÆMPFERIA ALBO-VIOLACEA Ridl., sp. nov.

Folia 2 ovata sessilia 5–9 cm. longa, 4 cm. lata glabra. *Flores* congesti inter folia circiter 8. *Calyx* tubulosa uno latere fissa, lamina lanceolata acuminata 1.5 cm. longa. *Corollæ* tubus gracilis 4 cm. longus. *Petala* oblonga obtusa sepalis latiora. *Labellum* obovatum, ungue longo breviter bilobum, lobis rotundis.

Dran, 3,000–4,000 ft. "White faintly tinged with violet. Lip darker and blotched with violet."

"This belongs to the affinity of *K. galanga L.*, but the flowers are much larger than in any species known to me and the lip but shortly lobed at the tip.

35. AMOMUM LACTEUM Ridl., sp. nov.

Folia glabra angusta linearia acuminata 24 cm. longa 5 mm. lata, vaginis angustis longis, ligula brevi truncata. *Capitulum* 2 cm. longum, scapo 11 cm. bracteis inferioribus ovatis, superioribus oblongis 2 cm. longis, cuspidatis, rachide velutino; bracteis capituli truncatis oblongis margine hirto. *Calyx* 2 cm. longus tridentatus, marginibus et dentibus hirtis. *Corollæ* tubus 2 cm.; lobi lineares oblongi 5 mm. longi. *Labellum* integrum obovatum 7 mm. longum 6 mm. latum. *Anthera* oblonga, crista biloba in angulis supremis.

Dran, 3,000–4,000 ft. "Flowers yellowish white, bracts reddish."

Allied to *A. uliginosum* Kœn, *var. lappaceum* Ridl., but with narrow leaves, hairy bracts and longer scape.

36. GEOSTACHYS ANNAMENSIS Ridl., sp. nov.

Rhizoma crassum lignosum vaginis coriaceis tectum. *Folia* 6 vel plura linearia-oblonga longe acuminata, subtus pubescentia demum glabrae: 30 cm. longa 4 cm. lata, vaginis 18 cm. longis rubropunctatis. *Scapus* erectus 14 cm. longus basi 7 cm. vaginis coriacees pluribus tecto, panicula 7 cm. longa compactus multiflorus. *Bracteæ* chartaceæ oblongæ 3 cm. longæ. Rami paniculæ 2-3 flori. *Pedicelli* 5 mm. *Calyx* tubulosus truncatus breviter in uno latere fissus 1.5 cm. longus. *Corollæ* tubus 2 cm. longus cylindricus

supernedilatatus, lobus posticus lanceolatus cucullatus cuspidatus 1.5 mm., laterales lineari-oblongi breviter cucullati. *Labellum* late obovatum trilobum, lobis lateralibus latis rotundatis medio angustiore oblongo, 3 cm. longum, 2.5 cm. latum. *Anthera* 7 mm. longa, crista tenui oblonga reniforme in dorso.

Dalat, 5,000 ft. "White tinged with pink and spotted crimson."

The genus *Geostachys* has been hitherto known only from the Malay Peninsula. This species has not secund flowers or rather branches as most of the species, and has a distinct thin crest.

37. ALPINIA BRACTEATA Roxb.

Langbian Peaks, 7,000 ft. "White lip crimson with yellow extremity.

Distrib. India, Burma, Shan States, Siam.

38. ALPINIA VELUTINA Ridl., sp. nov.

Folia lanceolata utrinque attenuata glabra 34 cm. longa 6 cm. lata. *Panicula* densa 11 cm. longa tomentosa. *Bracteæ* caducæ oblongæ obtusæ 1 cm. longæ molliter hirtæ. *Calyx* tubulosus densa hirtus 2 cm. longus apice breviter trilobo. *Corollæ* tubus æquilongus lobi spathulate cucullati hirti. *Labellum* carnosum, ungue longo, limbo decurvo obovato apice rotundato trilobo, nervis elevatis. *Anthera* oblonga dorso hirta appendice nullo filamentum petalo æquilongum. *Capsula* globosa rubra 1 cm. longa hirta.

Langbian Peaks, 6,500 to 7,000 ft. "Flowers white streaked with crimson, mantle pale green, fruit blood-red."

This very soft tomentose plant is allied to *A. Murdochii* Ridl.; *A. oxymitra* Schum. is also allied to it, but has distinct staminodes and a crested anther.

39. ALPINIA CONCHIGERA Griff.

Dalat, 5,000 ft. "White."

In young bud but I think it is this species.

Distrib. Burma, Malay Peninsula.

BURMANNIACEAE TO GRAMINEAE.

BY

DR. A. B. RENDLE, F.R.S.

BURMANNIACEAE.

40. BURMANNIA DISTICHA L.

Lian Khanh Falls, 3000 ft. In grassy swamps.

"Flowers violet and yellow."

Distrib. India, China, Australia.

LILIACEAE.

41. SMILAX ANNAMENSIS Rendle, sp. nov.

Frutex scandens, glaber. *Caules* subangulosi, laeves, aculeis parvis subrecurvis sparse armati. *Folia* ovata vel ovato-elliptica; apice acuta, basi rotundata demum subacuta, conspicue 5–nervia, nervi duo centrali propiores cum eo supra basin coaliti; petioli infra medium in vaginam subfoliaceam saepe cirrhiferam expansi. *Racemi* ♂ 2–umbellati, ♀ in exemplo unico 3–umbellati, inter folium et squamam ovatoacutam nunc fissam nascentes, folio duplo vel triplo breviores. *Bracteae* late ovato-cordatae, acumine setaceo. *Umbellae* multiflorae, globosae; alabastrae oblongae obtusae pedicelli tenues patentes. *Fl. mas.* Sepala oblonga, ut petala lineari-angustata paullo longiora demum revoluta; stamina 6, antherae obtusae demum excurvatæ. *Fl. fem.* Sepala anguste ovato-oblonga; petala e basi latiore linearia, sepalis subæqualia; stamina sterilia 3, sepalis opposita; stigmata pæne e basi libera, crasse linearia, excurvata.

Langbian Peaks, 6000 ft. "Flowers green and pinkish or pale crimson."

Leaves 10–16 cm. long by 4.5–9 cm. broad; petiole 2–4 cm. long. Bracts .5 cm. or less. Peduncles of umbels 2–4 cm. long, pedicels slender, generally 6–10 mm. long. Sepals and petals about 6 mm. long. Most nearly allied to the Indian *S. prolifera* Roxb., but easily distinguished by the few-umbelled inflorescence.

42. DIANELLA ENSIFOLIA Red.

Dalat, 5,000 ft. "Flowers blue and white; stamens yellow tipped with brown; fruit violet."

Distrib. Tropical Asia to tropical Australia, Mascarene Is.

43. Disporum pullum Salisb.

Langbian Peaks, 6,500 ft. "4 ft. tall. Flowers dull crimson, stamens yellow."

Distrib. Himalayas, Java, Sumatra, China.

PONTEDERIACEAE.

44. Monochoria plantaginea Kth.

Dran, 3,000–4,000 ft. "Flowers blue."

Distrib. India, Malay Archipelago, China, Japan.

ERIOCAULACEAE.

45. Eriocaulon Hookerianum Stapf.

Dalat, 5,000 ft. "Flowers white."

Distrib. Borneo and Malay States.

46. Eriocaulon Brownianum Mart.

Dalat, 5,000 ft. "In grass swamps. Flowers white."

Distrib. India, Ceylon.

COMMELINACEAE.

47. Commelina nudiflora L.

Daban, 650 ft; Dran, 3,000–4,000 ft. "Flowers blue."

Distrib. Tropics generally.

48. Aneilema giganteum R. Br.

Dran, 3,000–4,000 ft. "Flowers pale violet."

Distrib. Old world tropics.

49. Floscopa scandens Lour.

Daban, 650 ft. "Pale purple."

Distrib. India, Malaya, China, Australia.

AMARYLLIDACEAE.

50. Hypoxis aurea Lour.

Dran, 3,000–4,000 ft. Dalat, 5,000 ft. "In grass-land. Flowers yellow."

Distrib. India, Java, China, Japan.

51. Curculigo latifolia Dryand.

Dalat, 5,000 ft. "Flowers yellow."

Distrib. Burma, Malay Peninsula and Islands.

52. Crinum asiaticum L.

Dran, 3,000–4,000 ft. "Flowers deep pink and white."

Distrib. Tropical India, Ceylon.

DIOSCOREACEAE.

53. Dioscorea laurifolia Wall.

Dalat, 5,000 ft. "Flowers green."

Distrib. Penang.

CYPERACEAE.

54. Mariscus sieberianus Nees.

Dran, 3,000–4,000 ft.

Distrib. Warm regions of Old World.

55. Timbristylis nigrobrunnea Thw.

Dalat, 5,000 ft. "Brown with yellow inflorescence."

Distrib. India, Ceylon, Malay Peninsula.

56. Kyllinga monocephala Rottb.

Dran, 3,000–4,000 ft. "White."

Distrib. Tropical and subtropical regions of Old World.

57. Scleria chinensis Kth.

Dran, 3,000–4,000 ft. "Fruits white."

Distrib. China, Malaya, North Australia.

GRAMINEAE.

58. Panicum montanum Roxb.

Dran, 3,000–4,000 ft.

Distrib. India, Malaya, China.

59. Axonopus semialatus Hook. fil.

Dalat, 5,000 ft. "Brown."

Distrib. India, Philippines, China, Australia, Mauritius, S. Africa.

60. Thysanolæna agrostis Nees.

Dran, 3,000–4,000 ft.

Distrib. India, Malaya, South China, Mauritius.

DICOTYLEDONS.

POLYPETALÆ.

BY

Edmund G. Baker, F.L.S.

RANUNCULACEÆ.

61. Anemone sumatrana De Vriese.

Langbian Peaks, 6,000–7,000 ft. "White, centre green, stamens

yellow. Leaves pale and dark green."

Distrib. Sumatra.

MENISPERMACEÆ.

62. Cissampelos Pareira L.

Dran, 3,000–4,000 ft. "Flowers pale greenish."

Distrib. Widely distributed.

BERBERIDACEÆ.

63. Mahonia Klossii Bak. fil., sp. nov.

Frutex sec. cl. detectorem 10–15 pedalis ad *M. nepaulensem* D.C. et *M. japonicam* D. C. accedens. *Folia* imparipinnata, multijuga, jugo infimo remotiusculo et ceteris subaequante, foliolis sessilibus terminalibus petiolulatis coriaceis glabris supra subnitidis ovatis vel ovato-lanceolatis ad marginem dentatis, dentibus spinescentibus, spinis utrinque 3–4, 5.5–10 cm. longa, 2.5–4.0 cm. lata. *Flores* flavi in paniculas dispositi, paniculis foliis multo brevioribus. *Sepala* 9 glabra. *Petala* 6. *Ovarium* atro-caeruleum, ovato-globosum, stylo brevi, stigmate orbiculato.

Langbian Peaks, 6,500 ft.

"Shrub, 10–12 ft. tall. Leaves in terminal circles. Flowers yellow. Berries plumbeous." A plant with multifoliolate leaves, leaflets 17–25 and with 2–3 rather strong spines on each side.

Allied to *M. nepaulensis* D.C., *M. japonica* D.C., and *M. conferta* Takeda.

Differs from *M. annamica* Gagnep., in the number of leaflets, etc.

CAPPARIDACEAE.

64. Capparis grandiflora Wall, var. annamensis Bak. fil., var. nov.

Rami cinereo-pubescentes spinosi, spinis uncinatis brevibus. *Folia* ovata vel elliptico-ovata 2.0–3.5 cm. longa, 15–20 mm. lata, petiolo ±5 mm. longo suffulta. *Flores* solitarii, majusculi. *Ovarium* cinereo-pubescens, anguste oblongum.

Tour Cham. "Flowers pale yellow with a crimson or orange patch."

The species is described in the *Flora of British India* as having a glabrous ovary.

65. Capparis horrida L.

Tour Cham. "Crimson to purple."

Distrib. Widely distributed.

66. Capparis corymbosa Lam.

Tour Cham. "Yellow-white."

It is with considerable hesitation that I venture to refer this plant to the above African species, but it presents all the leading characteristics, namely, the branches have the short spines, the flowers are in fascicles, the buds globose and glabrous or nearly so, and the ovary is ovoid, glabrous and the stigma minute.

67. Niehuhria decandra Gagnep.

Tour Cham. "Greenish white."

Distrib. Cambodia, Siam.

VIOLACEÆ.

68. Viola annamensis Bak. fil., sp. nov.

Perennis. Folia ovata vel triangulari-ovata, margine serrata, glauca, glabra vel fere glabra, apice acuta, basi cuneata, graciliter petiolata, lamina 15–20 mm. longa, 13–18 mm. lata, petiolo 10–18 mm. longo suffulta. *Pedunculi* graciles, pubescentes, bibracteolati, apice reflexi. *Flores* parviusculi, solitarii, pallide violaceo-albi. *Sepala* lanceolata, omnia deorsum in appendices producta, lineis notata 4.5–5.0 mm. longa. *Petala* patentia, inferius deorsum in calcar breve productum. *Stylus* superne clavatus. *Capsula* ignota.

Dalat, 5,000 ft. "Flowers pale violet, lip white streaked with dark violet."

A plant with glabrous glaucous foliage and rather small flowers with a short saccate spur. The petioles are slender.

Allied in some respects to *V. serpens* Wall.

69. Viola serpens Wall.

Langbian Peaks, 6,000–6,500 ft. "White, lip streaked with violet; other petals faintly veined or tinged with violet."

Distrib. India.

70. Viola distans Wall.

Dalat, 5,000 ft. "Pale violet with darker violet blotches and reticulations."

Distrib. India.

PORTULACACEÆ.

71. Portulaca oleracea L.

Dran, 3,000–4,000 ft. "Flowers yellow, stem pink, succulent."

Distrib. Widely distributed.

HYPERICACEÆ.

72. Hypericum japonicum L.

Dran, 3,000–4,000 ft. Dalat, 5,000 ft. "Flowers yellow."

Distrib. Widely distributed.

MALVACEÆ.

73. Sida acuta Burm.

Dran, 3,000–4,000 ft. "Apricot yellow."

Distrib. Widely distributed.

74. Urena lobata L.

Dran, 3,000–4,000 ft. "Flowers with pink centre, carmine."

Distrib. Widely distributed in the Tropics.

75. Hibiscus sagittifolius Kurz.

Tambou, 2,700 ft. "Carmine. In tall grass swamps." A form of this species.

Distrib. Cochin-China, Cambodia, Laos, Siam.

STERCULIACEÆ.

76. Helicteres hirsuta Lour.

Dran, 3,000–4,000 ft.

Distrib. Cochin-China, Tonkin, Annam, Laos, Java, Philippines, &c.

TILIACEÆ.

77. Triumfetta pseudocana Sprague & Craib.

Dran, 3,000–4,000 ft. "Yellow."

Distrib. Siam.

RUTACEÆ.

78. Evodia triphylla D. C.

Dalat, 5,000 ft.

Distrib. Widely distributed.

BALSAMINACEÆ.

79. IMPATIENS PROTRACTA Hook. fil.

Dran, 3,000–4,000 ft. A herb with opposite leaves and with purplish red flowers in the axils of the leaves.

Lian Khanh Falls, 3,000 ft. "Flowers bluish red." Dalat. In wet grass land. "Flowers maroon red."

The above differ in size and colour of flowers but do not seem specifically separable.

Distrib. Annam.

AMPELIDACEÆ.

80. TETRASTIGMA PLANICAULE Gagnep., var. ANNAMENSIS Bak. fil., var. nov.

Cirrhosum scandens. Caulis glaber. *Folia* saepissime 4 foliolata, foliolis elliptico-lanceolatis margine serratis supra glabris penninerviis apice subacuminatis 9–13 cm. longis, 3–4·5 cm. latis longiuscule petiolulatis petiolulis 2–4 cm. longis, petiolo communi 7–10 cm. longo suffulta. *Inflorescentia* composita, multiflora, laxa, corymbosa. *Flores fœminei. Calyx* brevis, papillosus. *Petala* ± 4 mm. longa, extus sublente minute papillosa, lanceolata. *Ovarium* conicum, stylo brevissimo, stigmate dilatato 4–lobato. *Fructus* ignotus.

Langbian Peaks, 6,000 ft. A scandent shrub with usually 4–foliolate leaves and a lax corymbose cyme.

I have carefully compared this with the figure of *Vitis planicaulis* Hook. fil., Bot. Mag., t. 5685. The plant from Annam differs more particularly in having a much laxer broader inflorescence, and the leaves are only 4–foliolate.

81. LEEA COCCINEA Planch.

Dran, 3,000–4,000 ft. "Stem, buds, edges and base of leaves red."

Distrib. Burma.

ANACARDIACEÆ.

82. BUCHANANIA SIAMENSIS Miq.

Tour Cham. "Flowers greenish white."

Distrib. Siam.

LEGUMINOSÆ.

83. Uraria lagopoides D. C.

Dran. "Pale purple."

Distrib. Malaya, India, China, Polynesia, N. Australia.

84. Uraria crinita D. C.

Daban, 650 ft. "Blackish."

Distrib. India, China, Malaya, Siam.

85. Clitoria ternatea L.

Tour Cham. "Purplish blue."

Distrib. Widely distributed in the Tropics.

86. Desmodium ovalifolium Wall.

Dran, 3,000–4,000 ft. "Shrub, purplish red." Fruit required to confirm this identification.

Distrib. India.

87. Pithecolobium clypearia Benth.

Dalat, 5,000 ft. "Tree. Flowers greenish white."

Distrib. Tenasserim, Penang, Malacca, Malay Isles, China.

ROSACEÆ.

88. Rubus (Idæobatus) Klossi Bak. fil., sp. nov.

Caules fruticosi, glauci vel subglauci, glabri. *Rami* aculeis a basi dilatata subrectis armati, aculeis majoribus 8–9 mm longis. *Folia* pinnata 9–10 cm. longa, foliolis 8–11 ellipticis vel ovatis, margine serratis 2–3 cm. longis, 1–2 cm. latis, subtus incanis nervis lateralibus subtus prominentibus supra glabris, petiolulis brevissimis, foliolis terminalibus majoribus. *Stipulae* inaequilateraliter lanceolatae. *Inflorescentia* foliis brevior. *Flores* parviusculi, glomerati. *Calyx* in toto 5 mm. longus, extus incanotomentosus, lobis acuminatis. *Petala* pallide rosea, obovata, unguiculata cum ungue ±4 mm. longa. *Fructus* ignotus.

Dran, 3,000–4,000 ft. "Flowers pale pink." A plant with pinnate leaves, with leaflets incanous below and clusters of small flowers, allied to *R. trijugus* Focke, and *R. rosaefolius* Sm.

89. Rubus annamensis Card. (e descript.).

Langbian Peaks, 6,000–6,500 ft. A plant with palmately lobed leaves tomentose below, allied to *R. glomeratus* Blume.

Distrib. Annam.

90. Prunus occidentalis Sw.

Langbian Peaks, 6,500–7,000 ft. "White perfumed shrub or small tree."

Distrib. Widely distributed.

SAXIFRAGACEÆ.

91. Drosera lunata Ham.

Dalat, 5,000 ft. "Flowers white. In open grass-land."

Distrib. Widely distributed.

92. Drosera burmanni Vahl.

Dalat, 5,000 ft. "In wet grass-land. Flowers crimson. Pitchers greenish red. Leaves and stem red-green."

Distrib. Widely distributed.

CRASSULACEÆ.

93. Kalanchoe annamica Gagnep.

Tour Cham. "Yellow."

Distrib. Annam.

MYRTACEÆ.

94. Rhodomyrtus tomentosus Ait.

Djiring, 3,000 ft. "Pink."

Distrib. Widely distributed in Tropical Asia.

MELASTOMACEÆ.

95. Osbeckia chinensis L.

Dalat, 5,000 ft. "Flowers mauve. Growing in grass-land which is burnt yearly."

Distrib. Widely distributed.

96. Melastoma Klossii Bak. fil., sp. nov.

Species ad *M. decemfidum* Roxb. accedens. *Rami* subteretes, fuscohirsuti. *Folia* lanceolata vel oblongo-lanceolata, supra laevia vix strigillosa, subtus pallidiora, apice acuta vel subacuminata, saepius 5–nervia, lamina 6–10 cm. longa, 2·5–3·5 cm. lata, petiolo hirsuto 6–9 mm. longo suffulta. *Flores* 5–meri, saepissime terni. *Calyx* setis subulatis hirsutus, calycis dentibus lineari–lanceo–latis tubo brevioribus. *Petala* inaequilateraliter obovata 23–25 mm. longa. *Stamina* valde inaequalia, antherae lineari-subulatae, apice uniporosae, loculis undulatis, majores infra loculos connectivo producto et

antice bicalcarato. *Ovarium* superne pilis longis obtectum ad calycem plus minus adnatum.

Dalat, 5,000 ft. "In scrub at edge of forest."

Noticeable on account of the calyx being densely covered and the segments being narrow. The flowers are generally in threes.

The anthers of the larger stamens are 10 mm. long, those of the smaller 8 mm. long.

I have carefully compared it with specimens of *M. decemfidum* Roxb., collected by W. Jack on Penang Island. The flowers of *M. Klossii* are smaller and generally in threes, whilst those of *M. decemfidum* are solitary or subsolitary.

97. MELASTOMA CANDIDUM Don.

Dran, 3,000–4,000 ft. "Pale purplish pink."

Distrib. Widely distributed.

LYTHRACEÆ.

98. ROTALA ROTUNDIFOLIA Koehne.

Lian Khanh Falls, 3,000 ft. Dran, 3,000–4,000 ft.

Distrib. Widely distributed.

ONAGRACEÆ.

99. JUSSIEUA ANGUSTIFOLIA Lam.

Dran, 3,000–4,000 ft. "Flowers yellow."

Distrib. Widely distributed.

BEGONIACEÆ.

100. BEGONIA LANGBIANENSIS Bak. fil., sp. nov.

Herba caulescens, caule longitudinaliter striato validiusculo ad *B. laciniatam* Roxb., et *B. circumlobatam* Hance, accedens. *Stipulae* 2 liberae, subacuminatae. *Folia* parum inaequilatera palmatim usque ad medium 5–7 lobata, utrinque praecipue ad costam pilis adspersa, lobis lobulatis remote serratis apice acutis vel subacuminatis, 12–15 cm. longa, 13–16 cm. lata, petiolo 6–9 cm. longo praedita. *Flores* desunt. *Pedunculus* fructiferus 14–17 cm. longus. *Fructus* capsularis inaequaliter 3-alatus, ala maxima 12–15 mm. longa.

Langbian Peaks, 7,000 ft. "Leaves green, stems and fruit red." A plant allied to *B. laciniata* Roxb., with green leaves and

red stem. The leaves are palmately 5–7-lobed to about the middle, the lobes being themselves somewhat lobed. The fruiting peduncles are long, the capsule 3-alate, one wing being much longer than the others. It probably belongs to the section *Platycentrum*, but flowers are absent.

GAMOPETALÆ.

CAPRIFOLIACEÆ TO LABIATÆ.

BY

DR. H. F. WERNHAM.

CAPRIFOLIACEÆ.

101. LONICERA MACRANTHA Don.

Arbre Broyé, 5,400 ft. "Flowers white to yellow."

Distrib. India, China.

RUBIACEÆ.

102. ARGOSTEMMA BORRAGINEUM Blume.

Dalat, 5,000 ft. "Stamens yellow."

Distrib. Malaya.

103. HEDYOTIS EQUISETIFORMIS Wernham, sp. nov.

Herba humiliuscula inter gramina florens. *Caules* graciles altiuscule longitudinaliter canaliculati glabrati, basi sublignosi sparse ramosi, basinque versus cortice subargenteo stipularum necnon vaginae onusti reliquiis. *Folia* pro rata sessilia firmiuscule pergamacea angustissime lanceolata apicem versus leniter necnon conspicue acuminatissima atque acutissima, utrinque glabra; *venae* subtus prominentissimae laterales valde obliquae utrinque 2; stipulae infra in vaginam tardius cohaerentes tumidiusculam persistentem insuper in setam tenuissimam necnon elongatam productae quisque interpetiolaris. *Flores* minimi in cymulis trichotomis paucifloris umbellatis dispositi laxiusculis axillaribus; *pedunculi* tenues foliis multo breviores; *bracteae* inconspicuae saepius breves oblongo-lanceolatae. *Calyx* infundibularis lobis lanceolatis obtusis. *Corolla* anguste infundibularis lobis 5 patentibus.

Dalat, 5,000 ft. "Violet-white. In grass-land." A delicate little herb, branched from the base and sparsely branched above, 20–30 cm. in height. It is allied to the group with pedunculate in-

florescences, of which *H. vestita* is the principal example; but this new species is distinct in its delicate habit, very narrow leaves, and persistent stipular cup-like sheaths, the latter producing an appearance in the older nodes that has suggested the specific name. The nearest allies are, apparently, the Chinese *H. loganioides* Benth., and *H. Vachellii* Benth., both much coarser plants with large broad leaves.

Leaves 5–6 cm. × 5–8 mm.; sheath of *stipules* about 2 mm. deep, the solitary seta 5–7 mm. long. Primary peduncle not more than 1·5 cm. long. The whole flower is barely 2 mm. in length at maturity.

104. Oldenlandia subtilior Wernham, sp. nov.

Herba gracillima caulibus tenuissimis parum elongatis conspicue sub-lente canaliculato-striatis minutissime argenteo-pubescentibus, debilibus ascendentibus. *Folia* filimentosa-subulata necnon subrigida adscendentia opposita arcte revoluta glabra breviuscula acuta; *stipulae* interpetiolares simplices setaceæ. *Flores* 4-meri parvi plerumque solitarii in axillis superioribus oriundi; *pedicelli* tenuissimi ebracteolati multo excedentes. *Calyx* cum ovario glaber dentibus anguste triangularibus acutissimis. *Corolla* anguste campanulata inter minimas.

Lian Khanh Falls, 3,000 ft. "Pink."

A delicate little herb, 20–30 cm. high, very sparingly branched, with long internodes, and *leaves* (2 cm. long at most) and stems extremely slender. The setaceous *stipules* are as much as 3 mm. in length. *Pedicels* 1–1·8 cm. *Calyx*-lobes nearly 2 mm., *ovary* about 1 mm. long. *Corolla* 3–4 mm. long.

Allied to *O. Stocksii* from Malabar, but readily distinguished by the small and differently shaped flowers.

105. Ophiorrhiza Harrisiana Heyne.

Dran, 3,000–4,000 ft. "White."

Distrib. India, Malaya.

106. Mussaenda pubescens Ait.

Dalat, 5,000 ft. Lian Khanh Falls, 3,000 ft.

"Flowers orange-yellow, foliaceous calyx-segments pale yellow."

Distrib. China.

107. MUSSAENDA DRANENSIS Wernham, sp. nov.

Verisimiliter *frutex* ramulis glabris cortice striato in siccitate castaneo-brunneo onustis conspicue sparsiuscule lenticellatis gracilibus subteretibus. *Folia* inter minora pergamacea elliptica basi acuta apice acuminata acutissima, nisi subtus in venis primariis minute puberulo-strigillosa glabra, lateralibus utrinque ca. 5; *petiolus* gracilis minute strigillosus; *stipulæ* fugaces. *Flores* inter minores in cymis densiusculis corymbosis dispositi compositis foliis subaequilongis; *bracteæ* parvæ inconspicuæ subulatæ. *Calycis* limbus dentibus deltoideis acutissimis brevissimis onustus uno lobo nonnunquam in laminam petaloideam expanso suborbicularem basi acutissimam petiolo gracillimo, apice nec acuminatam necnon acutam. *Corolla* pro genere inter minimas angustissima basin versus fere filamentosa, extus minute strigillosa limbo angusto, lobis triangularibus subacutis.

Dran, 3,000–4,000 ft. "Flowers orange; foliaceous calyx-lobes yellowish white."

Leaves 8–10 cm. × 3–4 cm.; *petiole*, less than 2 cm. *Calyx*-teeth barely 1 mm. long, the petaloid lobe about 5 cm. × 3·5 cm. with stalk barely 1 cm. long.

This species is related to *M. variolosa* Wall., differing in the indumentum of stem and leaves, and in the shape of the latter, and specially distinguished by the extremely slender corolla, and the very inconspicuous calyx-lobes.

108. PAVETTA TOMENTOSA Smith.

Dran, 3,000–4,000 ft. "Flowers white. Small shrub."

Distrib. India, Malaya, South China, North Australia.

109. MORINDA POLYNEURA Miq., var. ASPERA Wernham, var. nov.

Ramuli densiuscule scabrello-puberuli; *folia* matura utrinque scabridula.

Dran, 3,000–4,000 ft. "Flowers white."

Distrib. This species has been recorded hitherto only from Java. The variety resembles the type closely in all respects save the indumentum.

110. Prismatomeris albidiflora Thw.

Dalat, 5,000 ft. "White; shrub."

Distrib. India and Malaya.

111. Psychotria montana King & Gamble.

Dalat, 5,000 ft. "Shrub. Flowers greenish-white."

Distrib. Ind. Or. and Malaya.

112. Psychotria Bodenii Wernham, sp. nov.

Frutex ramulis graciliusculis mox cortice rugosulo glaberrimo indutis. *Folia* glabra minuscula papyracea, anguste elliptico-lanceolata utrinque praesertim apicem versus acutum acuminata; *petiolus* breviusculus gracilis; *stipulae* breviter vaginantes insuper furcis 2 plus minus distantibus angustissime lanceolatis subsetaceis longiusculis divisæ. *Inflorescentia* cymosa pauciflora trichotome disposita foliis multo breviora, *bracteis* parvis etsi manifestis brevibus setaceis. *Flores* inter minimos, *corollæ* tubo pro rata lato brevi, lobis late lanceolatis 5 obtusiusculis deflexis. *Staminum* 5 antheræ ellipsoidea-oblongæ omnino exsertae filamentorum longitudinae manifesto.

Dalat, 5,000 ft. "Flowers white. A shrub."

Leaves 5–10 cm. × 1.5–2.8 cm., secondary veins up to 10 or 11 pairs; *petiole* rarely exceeding 1 cm. in length; *stipules* consisting of a sheath 2–3 mm. deep, with two prong-like projections, more or less setaceous, above, 5–6 mm. long. The inflorescence, a compound cymose umbel, measures about 4 cm. in diameter, the setaceous bracts 2 mm. at most in length, these being at the apex of the primary peduncles rather more than 1 cm. long. The whole *flower* is barely 3 mm. long; *calyx* 1 mm.; *corolla*-tube 2–2.5 mm., lobes rather more than 1 mm. long.

This species has undoubted relationship to the Indian *P. symplocifolia* Kurz, but it is readily distinguished by the leaf-characters and the stipules, alone.

113. Psychotria langbianensis Wernham, sp. nov.

Frutex ramulis graciliusculis diutius dense flavo-pubescentibus. *Folia* internodia multo excedentia firme papyracea, anguste elliptica utrinque aequaliter leniterque acuminata apice tamen non-

nunquam caudato-acuminata acuta, supra glabra subtus in venis tenuibus etsi manifestis præsertim centrali densiuscule pilis flavis onustis, lateralibusque primariis crebriusculis (utrinque circa decem): *petiolus* pro rata validiusculus brevis densiuscule pubescens basin versus plus minus inflatus; *stipulæ* longiuscule vaginantes insuper 2 in lobis vaginam subæquantibus divisæ lanceolatis submembranaceæ dorso carina prominente centrali onustæ. *Flores* in cymulis dispositi trichotomis subterminalibus foliis multo brevioribus, ramulis dense flavo-puberulis, *bracteis* parvis setaceis pedunculis brevibus. *Flores* inter minimos, albi. *Calyx* companulatus cum ovario extus densissime adpresse flavo-pubescens, lobis late triangularibus obtusis; *corollæ* tubus brevis necnon latus, lobi patentes anguste deltoideo-lanceolati apice inflexo. *Antheræ* exsertæ.

Dalat, 5,000 ft. "White. Shrub."

Leaves 5–9 cm. × 1.3–2.5 cm., with *petiole* not exceeding 8 mm. in length. Sheath of *stipules* 2–3 mm. deep, the upper lobes about the same in length. *Cyme* 3–4 cm. in width, the primary peduncles about 1 cm. long. *Calyx* about 1.5 mm. deep, the *corolla*-tube rather more than 2 mm. long and nearly the same in width at the mouth. *Anthers* about 6 mm. long.

This species is allied to *P. arborea* Ridley, of Java and Sumatra, from which it may be readily distinguished by the leaf characters—texture, indumentum, and venation—alone.

114. Lasianthus Wrayi King & Gamble.

Dalat, 5,000 ft. "Small tree; flowers white."

Distrib. Malay Peninsula.

115. Lasianthus dalatensis Wernham, sp. nov.

Frutex vel arbor parva nisi stipulis necnon corollis glaberrima polita, ramulis subteretibus rugosulis gracilibus laevissimis. *Folia* opposita utrinque glaberrima crassiuscule pergamacea elliptico-lanceolata saepius longe caudato-acuminata apice necnon basi acuta breviuscule petiolata; *venæ* primariæ præsertim subtus conspicuæ prominentes, laterales utrinque 7–9, reticulo interveniente manifeste transverso; *stipulæ* subcoriaceæ concaveæ lanceolatæ acuminatæ dorso dense griseo-hirsutae. *Flores* minimi in cymulis alaribus con-

gestis sessilibus dispositi paucifloris. *Calyx* latiuscule lobatus limbo brevi; *corollae* tubus cylindraceus basi paullo inflatus glaber, lobi breviter oblongi apice obtusi supra dense pulveruloento–puberuli.

Dalat, 5,000 ft. "Shrub or small tree. Crimson to pink and ultimately white."

Leaves 9–16 cm. × 2.5–4.5 cm.; *petiole* 1 cm. long at most. *Stipules* barely 5 mm. long before falling. *Inflorescence* scarcely 1.5 cm. in diameter, about equalling the leaf-stalks. *Calyx* about 1 mm. deep. *Corolla*-tube nearly 4 mm. long, lobes 1.5 mm long.

Related to the Malayan *L. constrictus*, but readily distinguished by the leaf-shape and venation.

116. PAEDERIA TOMENTOSA Blume.

Dran, 3,000–4,000 ft. "White, centre crimson with pale violet hairs; buds greyish-mauve."

Distrib. India, and Eastern Asia generally.

CAMPANULACEÆ.

117. LOBELIA TRIGONA Roxb.

Lian Khanh Falls, 3,000 ft. "Flowers white and violet."

Distrib. India (Eastern) and Java.

MONOTROPACEÆ.

118. MONOTROPA UNIFLORA L.

Dalat, 5,000 ft. "Growing in clumps on the ground. Waxy bluish-white."

Distrib. Himalayan region, China, Japan, N. America.

OLEACEÆ.

119. JASMINUM ANNAMENSIS Wernham, sp. nov.

Frutex ramulis graciliusculis subteretibus notabiliter densissime dulciter puberulis. *Folia* simplicia papyracea opposita ovata parum acuminata apice acuta basi truncato-obtusa nec cordata, utrinque dulcissime puberula; *petiolo* validiusculo pubescente nec longo. *Flores* albi in cymulis subcapitatis dispositi ramula brevia virgata ternimantibus. *Calyx* campanulatus puberulus limbi lobis aciculari-subulatis longiusculis. *Corolla* glabra tubo gracili inter breviores, lobis 7–9 ovato-lanceolatis breviter acuminatis, limbum subcampanulatum formantibus.

Djiring, 3,000 ft. "Flowers white."

Leaves about 6 cm. × 4 cm., with stalk up to 1 cm. in length. Branches of *inflorescence* (exclusive of corolla) about 5 cm. long, with a pair of small leaves close under the base of the inflorescence, *Calyx*-tube 3–4 mm. deep, the awl-shaped lobes 6–7 mm. long, rarely more. *Corolla*-tube 1.7 cm. or rather longer, lobes 1 cm. long, barely 5 mm. broad.

Allied to *J. pubescens* Willd., this species is readily distinguished by the smaller flowers, and the relatively much narrower corolla-lobes.

APOCYNACEÆ.

120. Carissa carandas L.

Tour Cham, "White, scented." Dalat, 5,000 ft. "Flowers blue, leaves purple-brown."

Distrib. India and Malaya.

121. Rauwolfia (Ophioxylon) serpentinum Benth.

Dran, 3,000–4,000 ft. "Shrub. Flowers white, buds dull pale crimson."

Distrib. Eastern India, Malaya.

LOGANIACEÆ.

122. Gærtnera viminea Hook. fil.

Dalat, 5,000 ft. "White, tipped pink. Small tree."

Distrib. Malay Peninsula.

GENTIANACEÆ.

123. Gentiana quadrifaria Blume.

Langbian Peaks, 6,000–6,500 ft. "Flowers blue and yellow." Dalat, 5,000 ft. "Blue. In open grass-land."

Distrib. E. India, China, and Malaya.

CONVOLVULACEÆ.

124. Evolvulus alsinoides L.

Tour Cham. "Blue."

Distrib. Everywhere in the tropics.

125. Ipomaea obscura Ker.

Tour Cham. "Yellow."

Distrib. Old World Tropics.

SOLANACEÆ.

126. Lycopersicum esculentum Mill.

Dran, 3,000–4,000 ft. "Flowers and fruit yellow."

Distrib. Native of the warmer parts of America; long introduced into most other warm and temperate countries, where it is cultivated for the sake of its fruit—the Tomato of commerce.

127. Solanum nigrum L.

Dran, 3,000–4,000 ft. "Flowers white, and stamens yellow."

Distrib. Ubiquitous.

128. Solanum indicum L.

Dran, 3,000–4,000 ft. "Purple, stamens yellow."

Distrib. India, Malaya, China to Philippine Islands.

129. Datura fastuosa L.

Tour Cham. "White."

Distrib. India, tropical Eastern Asia, tropical Africa. In America probably not native.

SCROPHULARIACEÆ.

130. Torenia asiatica L.

Dran, 3,000–4,000 ft. "Violet-blue; edge of lip and entire throat deep violet."

Distrib. Tropical Asia.

131. Vandellia pedunculata Benth.

Dran, 3,000–4,000 ft. "White or pale violet."

Distrib. India, Ceylon, Malay Peninsula.

132. Striga lutea L.

Dran, 3,000–4,000 ft. "Yellow."

Distrib. Asia and warmer parts of Africa.

133. Sopubia delphinifolia G. Don.

Dalat, 5,000 ft. "In open grass-land. Flowers primrose-yellow."

Distrib. Eastern India and Ceylon.

BIGNONIACEÆ.

134. Dolichandrone falcata Seem.

Tour Cham. "Pinkish white."

Distrib. India.

VERBENACEÆ.

135. Verbena officinalis L.

Dran, 3,000–4,000 ft. "Pale violet."

Distrib. World-wide.

136. Congea tomentosa Roxb.

Daban, 650 ft. "Greyish lilac bracts: very large."

Distrib. India, Burma, Siam.

LABIATÆ.

137. Acrocephalus Klossii, sp. nov.

Herba caulibus gracillimis e basi nonnunquam copiose ramosa, internodis tenuibus longissimis tenacissimis. *Folia* parva perpauca distantia pergamacea anguste elliptica apice obtusiuscula basi cuneata breviterque petiolata, *venis* lateralibus paucis (3–5) subtus valde prominentibus griseo-hirsutis. *Flores* minuti in capitulis lanatis dispositi nonnunquam spicatim cylindraceis; *bractæ* florales parvae numerosae dense aggregatae ovato-lanceolatae acuminatae apice acutissimae in siccitate nigricantes. *Calycis* labia integra extus dense griseo-strigosa. *Corollæ* parum e calyce exserta.

Lian Khanh Falls, 3,000 ft. "Flowers whitish and pink." A straggling and naked-looking plant. *Leaves* to 2.5 cm. long and 8 mm. broad, with *petiole* about 5 mm. long. *Heads* 1–2 cm. long, about 8 mm. wide. *Bracts* at base 8 mm. × 4 mm. *Calyx* 2 mm. in greatest depth. *Corolla*-tube and lips about 1 mm. each in length.

In its floral characters this species appears to be related to the African *A. cylindraceus* Oliv., but it is quite distinct in habit, also in size and shape of the leaves.

138. Scutellaria discolor Colebr.

Dran, 3,000–4,000 ft. "Pale blue, lip whitish."

Distrib. India, Burma, Malaya.

139. Scutellaria langbianensis Wernham, sp. nov.

Herba erecta e basi ramosa lignosa caulibus subteretibus circiter bispithameis gracilibus simplicibus minute necnon dense puberulis. *Folia* inter minora tenuiter membranaceo-papyracea elliptica utrinque nisi paucis in venis distantibus sparse strigosis glabrata in siccitate lævi-grisea, *petiolo* gracillimo necnon longo

velut caules dense minutiuscule puberulo. *Flores* inter minores terminali in racemo dispositi internodis conspicuis, *pedicellis* brevibus ebracteolatis. *Calyx* subcupularis ore hiante tumidiusculus venosus membranaceus; *corolla* parva inconspicua infra tubo tenuissimo longitudinis toti circa dimidium occupante, insuper plus minus subito dilatata.

Langbian Peaks, 6,500 ft.

The type-specimen consists of two shoots about 30 cm. long, joined at the base, from which fibrous roots spring. The stem is less than 3 mm. in the thickest part. *Leaves* about 6 cm. × 2.5 cm. at most, with stalk as much as 1 cm. in length. *Pedicels* 5 mm. long. The narrow, almost filamentous, lower part of the *corolla*-tube about 1 cm. in length; the upper part rather shorter, about 5 mm. wide, with lips sub-equal, about 5 mm.

This species is readily distinguished by the small leaves, with very few and distant teeth, cuneate base, and slender stalks.

140. Leucas aspera Sprengel.

Tour Cham.

Distrib. Mauritius, India, Java, Philippine Islands.

COMPOSITÆ.

By S. Moore, B.Sc.

141. Vernonia (§ Xipholepis) annamensis S. Moore, sp. nov.

Planta parva, semispithamea; caulis erectus fere e basi foliosus griseo-tomentosus. *Folia* sessilia lineari-oblanceolata pungenti-acuta basi obtusa margine distanter denticulata vel integra subcoriacea supra scabrida subtus griseo-tomentosa. *Capitula* circa 21-flosculosa pauca ramulos breves solitatim terminantia ita corymbum brevem terminalem 4-6-cephalum mentientia. *Involucri* campanulati phylla 6-serialia exteriora abbreviata subulata pubescentia cetera oblonga pungenti-acuta margine piloso-ciliata apice colorata necnon pubescentia. *Flosculi* punicei exserti. *Achenia* subcylindrica callo basali parvo optime 10-costata inter costas puberula. *Pappi* setae 1-2-seriatæ breviter barbellatæ dilute stramineæ perpaucæ exteriores nonnunquam abbreviatæ.

Le Bosquet, 5,000 ft.

Stem subterete, 2 mm. thick, really leafy from the bottom, but a few of the lowest leaves have been shed. *Leaves* up to 3 × 1 cm., but usually somewhat smaller, drying greyish, the veining prominent on their underside. *Inflorescences* 2-2.5 × 2.5-3 cm., the heads in the axils of leaves reduced to about 1 cm. more or less in length. *Peduncles* 3-6 mm. long, tomentose. *Involucre* 12 × 12 mm.; outermost leaves about 2-3 mm. long, intermediate 4-9 mm., innermost 10 mm. long. *Corollas* sparsely papillose with a narrowly infundibular tube 6.5 mm. long, double the length of the linear lobes. *Style-arms* 2.5 mm. long. *Achenes* 2.5 mm., pappus 6 mm. long.

Affinity with *V. bracteata* Wall.; differing chiefly in the lowly habit, smaller heads with fewer florets, narrower achenes and shorter pappus.

142. Vernonia (§ Xipholepis) dranensis S. Moore, sp. nov.

Ramuli elongati sat tenues subdistanter foliosi eximie longitrorsum striati scabridi. *Folia* subsessilia oblongo-lanceolata acuta vel obtusiuscula basi obtusa margine integra vel distanter denticulata papyracea utrinque scabriuscula. *Capitula* circa 23-flosculosa in paniculas axillares vel pseudoterminales quam folia breviores longior -esve ordinata. *Pedunculi proprii* involucro saepe circiter æquilongi uti pedunculus pubescentes. *Involucrum* campanulatum 6-seriale phyllis exterioribus parvulis subulatis patentibus recurvisve ceteris anguste oblongo-lanceolatis omnibus pungenti-acutis pubescentibus. Flosculi breviter exserti punicei. *Achenia* oblongo-turbinata callo basali prominente prædita 10-costata pubescentia. *Pappi* setæ 1-2-seriatæ (paucis exterioribus abbreviatis) breviter barbellatæ albæ.

Dran, 3,000–4,000 ft.

Probably a tall shrub, the specimens about two spans in height. *Leaves* 9-13 × 1.5-2.3 cm., grey when dry; midrib prominent on the lower side but thin; reticulation well seen on both faces; petioles 2 mm. long, broad, excavated on the upper side. *Panicles* 10-20 × 4-5 cm., their linear or subulate bracts 5 mm. more or less in length, at most 1 cm. *Involucres* 8 × 7 mm.; leaves of the outer two rows 2-3 mm. long, of the middle rows 4-6 mm., of the inmost row 7 mm., all pale straw with a green tip. *Corollas* infundibular

with pronounced narrowing in the lower half, sparsely papillose, including the 2 mm. long lobes, 8 mm. in length. *Style-arms* 2 mm. long. *Achenes* 2 mm. long; pappus 7.5 mm. with the short outer hairs about .5 mm. long.

Near the last, but quite different in habit, foliage and heads.

143. Elephantopus scaber L.

Dran, 3,000–4,000 ft.

Distrib. A tropical weed.

144. Ageratum conyzoides L.

Daban, 650 ft.

Distrib. A weed in both hemispheres.

145. Dichrocephala latifolia D. C.

Dran, 3,000–4,000 ft.

Distrib. Common in warmer parts of the Old World.

146. Conyza aegyptiaca Ait.

Dalat, 5,000 ft.

Distrib. Asia, Australia, Africa.

147. Blumea glandulosa D. C.

Tambor, 2,800 ft.

Distrib. East Asia, Malaya, Tropical Africa.

148. Blumea laciniata D. C.

Dalat, 5,000 ft.

Distrib. India, China, Malaya.

149. Blumea chinensis D. C.

Dran, 3,000–4,000 ft.

Distrib. India, China, Indian Archipelago.

150. Blumea Klossii S. Moore, sp. nov.

Caulis subteres foliosus pubescens; *Folia* (superioribus solummodo visis) petiolata ambitu obovata acuta pinnatifida pag. sup. pubescentia pag. inf. tomento cinereo obtecta segmentis paucis oblongo-ovatis acutis margine denticulatis folia summa imminuta sessilia vel subsessilia lineari-lanceolata acuta. *Capitula* inter minora in paniculam laxiusculam foliis majoribus circa aequilongam pubescentem digesta. *Involucri* anguste campanulati pubescentis phylla exteriora abbreviata lineari-lanceolata interiora linearia acuta.

Receptaculum puberulam. *Flosculi* breviter exserti ♂ ♀ pro capitulo circa 16. *Styli* fll. ♂ ♀ rami aliquanto complanati obtusiusculi. *Achenia* nondum matura cylindrica puberula. *Pappi* setae leves dilute stramineae.

Annam.

Leaves with a blade 6–8 cm. long, at most 3–4 cm. broad, running out below in a pubescent petiole 2–3 cm. long; lobes 1.5–2 cm. long, but often shorter; younger leaves usually 1.5–2 cm. × 5–8 mm. *Panicles* 7–8 × 6–7 cm. *Peduncles* (of individual heads) more or less 5 mm. long, occasionally reaching 1.5 or even almost 2 cm. *Bracts* linear, more or less 2 mm. in length. *Heads* in flower 6 × 6 mm. Involucre with outer leaves more or less 2 mm. long, and inner 5 mm. *Corolla* of ♀ florets 4 mm. long, their exserted style-arms nearly 2 mm. long. *Corolla* of ♂ ♀ florets 5 mm. long, its teeth triangular and pilose-ciliate. *Androecium* half-exserted. *Style-arms* 1.75 mm. long. *Achenes* barely 1 mm., setae of pappus 4–4.5 mm. long.

The chief distinctive mark of this species from among its allies is found in the pinnatifid leaves.

151. Laggera alata Sch. Bip.

Dran, 3,000–4,000 ft.

Distrib. India, China, Malaya, Tropical Africa.

152. Pluchea indica Less.

Dran, 3,000–4,000 ft.

Distrib. India, Malaya, China.

153. Wedelia albicaulis S. Moore, sp. nov.

Caules sat tenues caespitosi e rhizomate valido oriundi pauciramosi subdistanter foliosi scabridi. *Folia* brevipetiolata lanceolata vel lineari-lanceolata acuminata apice mucronulata basi rotundata trinervia margine denticulata pagina utravis scabrida. *Capitula* terminalia (raro itaque axillaria) pedunculis scabridis quam folia brevioribus insidentia. *Involucri* anguste campanulati scabridi phylla subbiseriata ovato-oblonga vel ovata obtusiuscula omnia rigida diluteque straminea. *Receptaculi* paleæ lineari-lanceolatæ trilobæ ciliatæ lobo intermedio elongato acuminato. *Ligulæ* 5 exsertæ apice 2–3-dentatæ. *Disci* flosculi 14 omnes etsi ♂ ♀ verisimiliter steriles.

Achenia radii oblonga compressa dorso rotundata necnon paucicostata superne scabriuscula disci linearia. *Pappus* cyathiformis dentatus incrassatus scabriuscule pubescens.

Daban, 650 ft.

Stems striate, with a dirty white cortex, 1.5–2 mm. thick. *Leaves* mostly 3.5–4.5 cm. long, towards the base 8–12 mm. broad; hispid petioles about 2 mm. long. *Peduncles* 3–15 mm. long *Involucres* 8 × 6 mm., the leaves 7 × 2–4 mm. *Paleæ* discoloured, 6.5 mm. in length. *Ligules* ovate-oblong, 6.5 mm. long. *Corolla* of disc-florets 4 mm. long. *Achenes* of the ray 4–4.5 mm. long, (inclusive of the nearly 1 mm. long pappus), and more than 1 mm. broad; of the disc 2.5 × .2 mm., the squamulose pappus being .35 mm. long.

154. Bidens tripartita L.

Dalat 5,000 ft.

Distrib. Europe, North Africa, North and East Asia, North America.

155. Tridax procumbens L.

Tour Cham.

Distrib. A South American introduction.

156. Gynura annamensis S. Moore, sp. nov.

Caulis ascendens tetragonus sparsim foliosus puberulus. *Folia* radicalia-caulina parva oblongo-vel lineari-lanceolata obtusa inferne petioliformi-extenuata margine undulata crassiuscula vix omnino glabra. *Capitula* homogama fere 50–flosculosa nonnunquam solitaria plerumque in corymbum laxum longipedunculatum oligocephalum parvibracteatum digesta. *Pedunculi* proprii involucro breviores pubescentes. *Involucri* anguste campanulati pubescentis phylla 14 lineari-oblonga sursum attenuata apice acuta marginibus scariosis additis circiter 10 multo brevioribus linearibus calyculum constituentibus. *Flosculi* lutei breviter exserti. *Styli* rami breviter extrusi. *Achenia* (hucusque cruda) oblongo-turbinata glabra. *Pappi* setæ scabruisculæ albæ.

Dran, 3,000–4,000 ft.

Leaves including the stalklike portion up to 6.5 × 1 cm., but sometimes about 4 cm. × 5 mm. or even less, drying greyish, a few

uppermost linear and about 2 cm. in length. *Peduncles* usually 10–20 cm. long, slender; proper peduncles usually 1–2 cm. long, with narrow bracts of 2–4 mm. *Involucres* 8 mm. long, the often carinate leaves 1.25–nearly 2 mm. broad. *Corollas* with narrowly infundibular tube 8 mm. long, expanding to rather more than 1 mm. under the limb; lobes oblong, obtuse, 2 mm. long. *Style-arms* 3 mm. in length. *Achenes* 1.5 mm., pappus 8 mm. long.

157. AINSLIAEA PTEROPODA D.C.

Langbian Leaks, 7,500 ft.

Distrib. India, Malay Peninsula.

158. GERBERA PILOSELLOIDES Cass.

Dalat, 5,000 ft.

Distrib. India, China, Madagascar, Tropical and South Africa.

159. LACTUCA VERSICOLOR Sch. Bip.

Dran, 3,000–4,000 ft.; Langbian Peaks, 6,500 ft. A specimen from Daban, 650 ft. with a brown pappus may perhaps be a form of this very variable species.

Distrib. N. Asia, China.

160. LACTUCA KLOSSII S. Moore, sp. nov.

Herba fere glabra, circiter bispithamea. *Caulis* ascendens frequenter ramosus uti rami gracilis quadrangularis necnon in longitudinem striatus. *Folia* pauca parva anguste linearia obtusiuscula. *Capitula* inter minora in paniculam laxam pleiocephalam ordinata pedunculis propriis filiformibus quam involucrum longioribus nudis vel bractea parvula donatis. *Involucri* cylindrici puberuli phylla ext. pauca linearia vel anguste lineari-lanceolata obtusa acutave interiora 8 oblonga obtusa marginibus decoloribus. *Flosculi* pro capitulo 10 corollis bene exsertis. *Achenia* compressa anguste linearia in rostrum breve extenuata paucistriata. *Pappi* setæ scabrida albæ.

Dran, 3,000–4,000 ft.; Dalat, 5,000 ft.

Stem in its lower part about 2 mm. thick and leafless there or nearly so; branches 1 mm. or less in thickness, their leaves few and far between. *Leaves* more or less 1 cm. long, sometimes only 5 mm.

or even less, sometimes 2 cm. *Peduncles* (of individual heads) generally 1–2 cm. in length, their bract when present about 1 mm. long. *Involucres* about 7.5 × 4 mm.; outer leaves usually 2–3 × .5–1 mm.; inner 7 × 1.5 mm. *Corollas* 1 cm. long, of which the oblong 5-toothed ligule claims 7 mm. *Achenes* (including the 1.5 mm.-long beak) 6 mm. long, barely .5 mm. broad, much compressed, straw-coloured. *Pappus* 5 mm. long, apparently persistent.

The frequently branching, almost leafless habit, with the strong quadrangular stem and branches, serve to identify this among its nearest allies.

ASCLEPIADACEAE.

By S. Moore.

161. Toxocarpus Klossii S. Moore, sp. nov.

Planta scandens. *Caulis* volubilis ramosus, fulvo-sericeus deinde glaber. *Folia* petiolata anguste oblongo-ovata apice basique obtusa coriacea supra glabra pallideque nitida subtus praesertim in nervis fulvo-sericea. *Cymae* terminales leviterve extra-axillares foliis saepius breviores pedunculatae ramosae pluriflorae fulvo-sericeae. *Flores* pro rata majusculi breviter valideque pedicellati. *Calyx* sericeus segmentis ovato-oblongis obtusiusculis. *Corollae* tubus calyce paullulum brevior, lobis oblongo-lanceolatis sursum curvatis apice acutis glabris. *Coronae* phylla quam antherae paullulum longiora gynostegio prope basin imposita linguaeformia obtusa intus appendice parvula filiformi instructa; *retinacula* linearia. *Stylus* filiformis longit. petala fere semi-aequans apice subaequaliter biramosus.

Tour Cham.

Stems slender, the young branches much twisted. *Leaves* up to 7 × 2.8 cm., more often about 4.5–6 × 2–2.3 cm., drying greyish, paler below; midrib impressed above, prominent below; side-nerves 4–5 on each half of the leaf, and but little visible on its upper face; petioles stoutish, fulvo-sericeous, 5 mm. or less in length. *Cymes* usually 3–5 cm. long; the peduncle more or less 1 cm. *Pedicels* 1 mm. in length or rather longer. Flowers yellow. *Calyx* 2.5 mm. long. *Corolla* with 2 mm. long tube and 6.5 mm. long lobes. *Corona*

.65 mm. long. *Pollinia* ovoid, about. .1 mm. long. *Style*, including the 1 mm. long arms, 3 mm. in length.

This can be distinguished from *T. Hosseusii* Schlechter by the more hairy leaves and the smaller flowers with shorter calyx-segments and markedly shorter and relatively broader corolla-lobes; the coronal leaves also are smaller and with a tiny very narrow appendix, and the style is much thinner.

Schlechter has described the style of *T Hosseusii* wrongly, thus leading Costantin (Flore Gen. Indo-China, IV. 47) to place the species among those with an entire style, whereas that organ is most clearly biramose.

162. CALOTROPIS GIGANTEA R. Br.

Tour Cham.

Distrib. India to South China and Malay Archipelago.

163. TYLOPHORA DALATENSIS S. Moore, sp. nov.

Caulis gracilis volubilis bene foliosus glaber. *Folia* petiolata oblongo-lanceolata acuta basi truncato-undulata tenuiter membranacea glabra costis lateralibus utrinque 5–6 delicatulis. *Cymae* laterales solitariae nisi binae quam folia saepius paullo breviores laxe pluriflorae glabrae. *Pedicelli* tenues quam pedunculus breviores. *Calycis* segmenta lanceolata acuta corollae tubo aequilonga. *Corollae* lobi ovati obtusi tubum duplo excedentes. *Coronae* phylla oblonga basi gibbosa superne columnae stamineae omnino adnata carnosa. *Antherae* erectae membrana brevi rotundata inflexa terminatae. *Stigma* crassum umbonatum antheras haud vel levissime superans.

Dalat. 5,000ft.

Leaves mostly 5–7 × 1.7–2.5 cm., green when dry, the reticulum forming a fine network visible only under the lens; petioles 6–9 mm. long. Inflorescence usually 4–5 cm. long, the slender peduncles more or less 2 cm. in length. *Cymules* minutely bracteate, composed for the most part of 3–5 flowers. *Pedicels* more or less 1 cm. long. *Flowers* yellowish green, when moistened about 9 mm. in diameter, the oblong-ovoid buds 4 mm. in length. *Calyx*-segments 1.5 mm., tube of corolla 1.5 mm. long; corolla lobes 3 × 2.2 mm.

Corona with leaves 6 mm. long. *Anthers* .25 mm. long. *Pollinia* ovoid, .15 mm. long. *Stigma* about 1 mm. in diameter.

Appears from Costantin's clavis (l. c. 106) to come nearest *T. Pierrei* Cost., differing from it in shape of leaves and short petioles, shorter inflorescences, and smaller flowers with broader calyx segments and coronal leaves united to the stamens throughout except for the gibbous base.

164. Hoya parasitica Wall.

Dalat, 5,000 ft.

Distrib. India, Malay Peninsula, Siam, Cochin-China.

ACANTHACEÆ.

By S. Moore.

165. Strobilanthes (Eustrobilanthes, Bracteatæ) squalens S. Moore, sp. nov.

Verisimiliter *frutex* vel *suffrutex*. *Ramuli* subteretes foliosi scabridi. *Folia* obovata vel late obovato-oblonga obtusa nonnunquam breviter cuspidato-acuminata basin versus in petiolem brevem gradatim attenuata margine obtuse dentata vel solum undulata pergamacea utrobique scabrida. *Spicæ* pedunculatæ foliis breviores densifloræ. *Bracteæ* lanceolatæ obtusæ uti inflorescentiæ axis scabride hispidissimæ. *Bracteolæ* parvulæ filiformes calyce plane breviores. *Calycis* segmenta fere usque basin divisa linearia obtusa hispidissima. *Corollæ* flavæ intus albo-pilosæ tubus inferne tenuis a medio inflatus limbi lobi postici paullo altius connati. Stamina 4 filamentis in membranam corollæ omnimodo adnatam connatis. *Staminodium* O. *Ovarium* apice glandulosum. *Stylus* breviter puberula. *Capsula* oblonga apice subpungens microscopice puberula 4-sperma. *Semina* complanata suborbicularia margine pilis hygroscopicis copiosissime induta.

Daban, 650 ft.

Leaves up to 10 × 5.5 cm., more usually about 8 × 3 cm., sometimes reduced to 6 × 2.5 cm. or even less, grey-green when dry, very scabrous; petioles about 5 mm. long. *Spikes* on 5–25 mm. long peduncles, up to 3 × 1.5 cm. *Bracts* mostly about 1.5 cm. long, in the middle 5 mm. wide. *Bracteoles* only 2.5–3 mm. long. *Calyx* 7 mm. long. *Corolla* 14 mm. long; tube barely 2 mm. wide below, in the upper

half about 5 mm.; lobes suborbicular, about 3 × 3 mm. *Filaments* of front stamens 3 mm., of hinder-pair 1 mm. long; anthers obtuse, 1.7–1.9 mm. long. *Ovary* nearly 2 mm., style 9 mm. long. *Capsule* 9 × 2.2 mm., light brown; seeds barely 2 mm. in diameter.

At sight this is barely distinguishable from the Indo-Burmese *S. scaber* Nees, as understood by Clarke: the somewhat smaller flowers with greatly reduced filiform bracteoles afford an easy means of identification.

A small specimen from Dran, 3,000–4,000 ft., is conspecific.

166. STROBILANTHES (EUSTROBILANTHES, NUDATÆ) SALTIENSIS S. Moore, sp. nov.

Frutex suborgyalis ramulis aliquanto anfractuosis ad nodos tumidis citis glabris. *Folium* unicum juxta ramuli apicem solum visum subsessile lineari-oblongum basi attenuatum glabrum. *Flores* breviter pedicellati in capita distantia pedunculata pauciflora digesti. *Bracteæ bracteolæque* fugaces. *Calyx* fere usque basin partitus segmentis elongatis linearibus obtusis uti pedicelli glanduloso-pubescentibus. *Corolla* dilute albo-punicea tubo quadrante inf. constricto inde gradatim dilatato lobis inter sese fere æqualibus suborbicularibus. *Stamina* 4. *Ovarium* sursum glandulosum. *Stylus* elongatus fere glaber. *Capsula* calyce paullo brevior oblonga acuta 4-sperma. *Semina* suborbicularia pilis appressis dense obsita.

Langbian Peaks, 6,500ft.

Leaf apparently about 4 cm. long (top not seen), only 3.5 mm. broad. *Peduncles* of the flowering heads slender, usually 1–2 cm. long. *Pedicels* 3–4 mm. Calyx 25–28 mm. long. *Corolla* 34 mm. long, the narrow portion 8 × 2 mm., tube enlarged to 10 mm. wide in the middle and 15 mm. at the throat; lobes 5 × 5 mm. *Anthers* ovate, 1.5 mm. long. *Ovary* narrowed below, 6 mm., style 20 mm. long. *Capsule* 18–20 mm. in length, brown. *Seeds* grey, 4 × 4–4.5 mm.

A very distinct species, near *S. isophyllus* T. And., and *S. oligocephalus* T. And. The narrow leaves and long lobes of the calyx are special features.

The material is incomplete, there being but one leaf, and that not quite entire, as well as only a single corolla, which it has been

thought advisable not to dissect. In spite of this there seems ample warrant for publishing a description.

167. Blepharis boerhaavia Pers.

Tour Cham.

Distrib. East Indies, Tropical and South Africa.

168. Cystacanthus turgidus Nichols.

Daban, 650ft,

Distrib. Cochin China.

169. Lepidagathis hyalina Nees.

Dran, 3,000–4,000 ft.

Distrib. East Indies, South China.

170. Justicia procumbens Linn.

Dran, 3,000–4,000 ft.

Distrib. Africa, East Indies, Australia.

* *CYCLACANTHUS,*

Acanthacearum e tribu Justiciearum genus novum.

Calyx alte 5-partitus, segmentis aequalibus linearibus. *Corollae* tubus sat elongatus, sursum incurvus, infra medium constrictus inde gradatim inflatus; limbus bilabiatus, labio postico aestivatione interiore late ovato sursum attenuato apice emarginato, antico tripartito lobis linearibus. *Stamina* 2, faucibus inserta; antherae biloculares, loculis paullo inaequialtis basi muticis. *Pollinis* grana globosa, poris 3 induta, tenuiter paucicostata, inter costas subtiliter punctulata. *Discus* cupularis. *Stylus* filiformis, apice bifidus. *Ovula* quove in loculo 2. *Capsula* ———. ——— *Suffrutex?* *Folia* parva, integerrima. *Flores* coccinei, in axillis saepius verisimiliter foliis jam orbis breviter cymoso-subspicati, rarius subsolitarii. Bracteae parvulae.

171. Cyclacanthus coccineus S. Moore, sp. unica.

Rami sat validi cortice ochraceo obducti prominenter costati foliorum delapsorum cicatricibus prominulis hacataque illac minuti juveniles minutissime cinereo-pubescentes tandem glabrescentes. *Folia* brevipetiolata ovata apice basique obtusa membranacea supra

* Gr. Kuklein, to bend, in allusion to the shape of the corolla.

glabra subtus secus nervos appresse pubescentia puberulave necnon microscopice pustulato-cystolithigera. *Flores* mediocres subsessiles. *Bracteae* lineares uti inflorescentiae axis calyceoque dense glanduloso-pubescentes. *Calycis* segmenta acutiuscula. *Corollae* calycem facile superantis tubus extus puberulus. *Stamina* breviter exserta, ovarium oblongo-ovoideum fere glabrum. *Stylus* elongatus basi pilosulus.

Tour Cham.

Leaves 2–3.5 × .1.3–1.8 cm., when dry, dark above, greyish green below; petioles up to 5 mm. long, minutely pubescent. Axis of the *inflorescence* reaching nearly 2 cm. in length, more often about 1–1.5 cm., sometimes only 5 mm. long. *Bracts* about 2 mm. long. *Bracteoles* not seen. *Calyx* with segments 6 × .5 mm. *Corolla* 17 mm. long in the tube, at the base 2.5 mm. wide, this soon reduced to 1.25 mm. hence gradually enlarged to 5 mm. at the throat; upper lip 7 mm. wide at the base, reduced to 1 mm. some distance below the top; lobes of lower lip apparently reflexed, or at least patent, 7 × .5 mm. *Filaments* flattened, glabrous, 9 mm. long; anthers with oblong, obtuse, 2.5 mm. long, cells. *Disk* fleshy, .65 mm. high. *Ovary* 2.5 mm., style 2 cm. long.

This plant has given much trouble, as, while evidently closely allied to several genera, it cannot be included in one of them without enlarging already recognised boundaries. It was at first thought to be referable to *Clinacanthus*, but the two-celled anthers exclude it; then it appeared to fit in with *Graptophyllum*; for although the inflorescence is not that of the well-known *G. pictum* Griff. (*G. hortense* Nees), the Australian *G. Earlii* F. Muell. has a very similar arrangement of its flowers. But *Graptophyllum* has, besides two stamens, a couple of staminodes, organs there is no sign of in the plant under notice, though it is undoubtedly its affinity. In the absence of staminodes it agrees with the Papuan *Calycacanthus*, but this genus has quite a different corolla.

172. PERISTROPHE FERA var. INTERMEDIA Clarke.

Daban, 650 ft.

Distrib. Pegu, Tenasserim.

APETALÆ.

By S. Moore.

POLYGONACEÆ.

173. Polygonum chinense L.

Dran, 3,000—4,000 ft.

Distrib. India, China, Japan, Malaya.

174. Polygonum strigosum R. Br.

Dran, 3,000—4,000 ft.

Distrib. India, China, Malaya.

PIPERACEÆ.

175. Peperomia reflexa Dietr.

Langbian Peaks, 6,500—7,500 ft.

Distrib. East Asia, Malaya, Australia, Africa, America.

NEPENTHACEÆ.

176. Nepenthes annamensis Macfarl.

Lian Khanh Falls, 3,000 ft., and Dalat 5,000 ft. "In swampy grass-land. Pitchers yellow to green with crimson or pinkish spots."

The specimens have been compared with authentic material in the Kew Herbarium with which they seem to agree well, except that none of the pitchers have the ciliate wings sometimes found on those of *N. annamensis*. The latter's flowers and fruits were not seen by Macfarlane (Pflanzenreich, 36 Heft (IV. iii.) p. 39.); the fruits, but not the flowers, can now be described; they are borne in a rather close raceme about 6 cm. in length on about 35 cm. long peduncles, and are fusiform in shape, with oblong-lanceolate, truncate, glabrous, palely-shining, brown valves, varying in length from 12 to 15 mm.

The above naming must obviously be regarded as provisional.

Distrib. Annam.

ELAEAGNACEÆ

177. Elaeagnus annamensis S. Moore, sp. nov.

Ramuli graciles subteretes brunneo-lepidoti mox glabrescentes. *Folia* petiolata obovato-oblonga obtusa vel obtusissima basi obtusa chartacea supra cito glabra leviterque nitidula subtus arcte brunneo-argenteo lepidota nervis lateralibus utrinque 5–6 supra planis subtus

prominulis. *Flores* pedicellati axillaries solitarii vel pauci ramulos breves subumbellatim terminantes omnimodo arcte brunneo-argenteo-lepidoti. *Perianthium* inferne oblongo-ovoideum supra constrictionem anguste campanulare lobis ovatis acutis tubum semiaequantibus. *Filamenta* antheris paullulum longiora basi annulo parum prominulo pubescente connexa. *Fructus* subovoideus fortasse fere exsiccus saltem in sicco anguste alateus arcte lepidotus.

Langbian Peaks, 6,000 ft.

Apparently a *shrub* with slender, leafy, brown branches. *Leaves* with the blade 5–7 × 3–4 cm., but sometimes smaller or larger, green or grey-green above and at first covered with small scales which soon disappear, closely scurfy below; petioles usually about 1 cm. in length, closely scurfy. *Pedicels* slender, up to 12 mm. in length, though often shorter. *Perianth* with the adherent portion at first only 2 × 1.5 mm., but rapidly enlarging to 10 × 5 mm.; free portion (including the 4 × 3 mm. lobes) 12 mm. long, 3 mm. wide at the base, and 6.5 mm. under the limb; the lobes with fewer silvery scales on their inner than upon their outer face. *Filaments* 2 mm. long; anthers broadly oblong, obtuse at either end, 1.5mm. long. *Style* shortly exserted, 11 mm. long. *Fruit* apparently not yet quite ripe, 15 × 7 mm.

In foliage this agrees with the widely diffused *E. latifolia* L; the longer slender pedicels and the size and the shape of the perianth, both tube and limb, are, points of difference.

LORANTHACEÆ.

178. Loranthus (§Elytranthe) dranensis S. Moore, sp. nov.

Frutex scandens. *Rami* subteretes longitrorsum costati crassiusculi glabri. *Folia* opposita petiolata oblongo-lanceolata vel ovato-oblonga obtusa obtusis-simave basi rotundata costis lateralibus utrinque saltem 12 parum perspicius rete arcto sejunctio opacta coriacea glabra. *Spicae* 2–3-florae pedunculo brevi valido insidentes. *Bracteae bracteolae* que amplae calycem facile superantes ovato-oblongae obtusae vel apice rotundatae crassae glabrae. *Calycis* tubus oblongo-ovoideus truncatus. *Corolla* ex bracteis longe eminens tubo incurvo sursum gradatim dilatato quam lobi 6 anguste lineari-

lanceolati acutiusculi longiore. *Filamenta* valida compressa antheris linearibus acutis. *Stigma* subglobosum.

Dran, 3,000–4,000 ft.

Branches pale-coloured, the oldest 5 mm., the younger 2–3 mm. wide.

Leaves with a blade 8.5–12 cm. long, at the middle 3.5–4 cm. broad, grey-green when dry; petioles stoutish, channelled above about 2 cm. long. *Peduncles*, 5–7 mm. long, somewhat angular, 3 mm. across, after boiling. *Bracts* and *bracteoles* about 1 cm. in length, the former rugulose on the back, reddish brown. *Calyx-tube* 4 mm. long. *Corolla tube* (unmoistened) about 3 cm. long, 3 mm. wide below, 5 mm. near the top, pink; lobes 2 cm. long, purple at base, carmine above. *Filaments* (of bud) 7 mm., anthers 5 mm. long. *Berry* ovoid, 10 × 8 mm., brown when ripe.

L. albidus Bl. has similar foliage, but slenderer peduncles, smaller bracts and bracteoles and corollas unlike in several respects.

BALANOPHORACEÆ

179. Balanophora (Diphora) annamensis S. Moore, sp. nov.

Rhizoma sparsim lobatum omnimodo pustulis stellatis arcte indutum. *Squamae pedunculi* paucae imbricata ovatae vel ovato-oblongae obtusae. *Capitula* magna dioica. *Bracteae* ♂ oblongo-obovoideae triquetrae apice truncatae tuberculioque parvulis obsitae.

Perianthium 4–5-lobum lobis oblongo-lanceolatis. *Antherae* 4–5 in columnam connatae loculis hippocrepiformibus. *Flores* ♀ receptaculo necnon spadicellorum ampulliformium stipiti crasso inserti. *Ovarium* subsessile ovoideum in stylum loniorem desinens.

Dalat, 5,000 ft.; Langbian Peaks, 6,000 ft.

Rhizome up to 7 cm. in thickness, sometimes reduced to 3 cm.; pustules dull brown, nearly 3 mm. high and somethat more in diameter, each with several deep radiating grooves. *Peduncle* short, about 1–1.5 cm. long and some 2 cm. broad; the squamae coriaceous, brown, shining, 3–nearly 4 × 1.5–nearly 2 cm. *Receptacle* ♂ cylindrical, 8 × 4 cm. *Perianth* with flattened 10–14 × 1.5–2 mm. tube and 5 mm. long spreading lobes. *Bracts* 4–5 mm. wide, at the more or less quadrangular top 3 × 3 mm. *Staminal column* 6 mm. long. *Receptacle* ♀

obovoid-pyriform, 6 cm. long, 2.2 cm. wide, below, 4 cm. above. *Spadicels* on .75 mm. long stalks, the body twice as long. *Ovary* .4 mm. long; style barely 1 mm.

The material consists of two specimens, two male and two female, only the latter with the rhizome attached. Nevertheless they are considered to form but one species, and that although the receptacular bracts are broader in one case and a little differently marked on their truncate top; this, however, may perhaps be a matter of age.

Besides the deeply furrowed pustules of the rhizome the chief marks of the species are the quadrangular tuberculate tops of the bracts, the bottle-shaped spadicels and the subsessile ovaries.

SANTALACEÆ.

180. PHACELLARIA TONKINENSIS Lecomte.

Dran, 3,000–4,000 ft.

Agrees with the description in Bull. Mus. Nat. Paris, 1914, p. 399, except that the most advanced fruit, evidently not yet ripe, measures only 5 mm. in length instead of 8–9 mm. Some doubt must therefore attend this determination, especially as M. Lecomte, with one exception, does not give floral measurements.

Distrib. Tonkin.

EUPHORBIACEÆ.

181. MELANTHESOPSIS FRUTICOSA Muell.-Arg.

Tour Cham.

Distrib. South China, Cochin-China, Borneo.

182. OSTODES KERRII Craib.

Langbian Peaks, 5,000–6,000 ft. "A small tree. Flowers pinkish-white. Stamens pale yellow."

Distrib. Siam.

183. HOMONOIA RIPARIA Lour.

Daban, 650 ft.

Distrib. India, Malay Peninsula, and Malay Archipelago.

URTICACEÆ.

184. BOEHMERIA NIVEA Hook. & Arn.

Dran, 3,000–4,0000 ft.

Distrib. East Asia. Malaya.

JUGLANDACEÆ.

185. Engelhardtia spicata Bl.

Langbian Peaks, 6,500 ft.

Distrib. India, South China, Malay Peninsula and Archipelago.

CASUARINACEÆ.

186. Casuarina equisetifolia L.

Nhatrang.

Distrib. India (chiefly cultivated) to Australia and Polynesia.

GYMNOSPERMAE.

TAXACEÆ.

187. Dacrydium elatum Wall.

Le Bosquet, 5,200 ft.

Distrib. Malay Peninsula and Western Archipelago, Cochin China.

CRYPTOGAMS

BY A. Gepp.

PTERIDOPHYTA.

188. Adiantum Klossii Gepp, sp. nova.

Stipite c. 20 cm. longo ad basin ramentaceo scabrove atropurpureo nitido, ramis alternis superne pubescentibus; fronde 12–15 cm. longa, 10–12 cm. lata, deltoideo-ovata tripinnata, pinnis infimis obscure pedatis; segmentis alternis subrotundatis sæpe dimidiatis interdum late cuneatis, 8–10 mm. latis, margine externo crenulatis, papyraceis firmis glabris inferne glaucescentibus, haud deciduis; venulis flabellatim dispositis furcatis marginem cartilageneum attingentibus; soris 3—5 parvis rotundatis contiguis vel confluentibus.

Daban, 650 ft.

An intermediate species allied to *A. flabellulatum* in sori and pubescence but not in habit. It appears to differ from *A. induratum* Christ (Langbian) in its larger frond, pubescent petioles and less opaque segments, from *A. Bonii* Christ (Tonkin) in size, ramification, pubescence and sori, and from Copeland's two Philippine species, *A. cupreum* and *A. opacum*, in its non-deciduous segments.

189. Selaginella atroviridis Spring.

Dalat, 5,000 ft.

Distrib. S. India to Formoso.

BRYOPHYTA.

190. Pogonatum aloides Brid.

Langbian Peaks, 7,000 ft.; in pine and oak forest.

Distrib. Europe, Asia, Africa.

LICHENES.

191. Lobaria pulmonaria Hoffm.

Langbian Peaks, 6,000 ft.

Distrib. All temperate regions.

REPORT ON A COLLECTION OF DRAGONFLIES FROM THE LAO COUNTRY.

BY

MAJOR F. C. FRASER, I. M. S.

With a Plate.

[The dragonflies here listed were obtained by a native collector during a recent expedition to the north of Siam and adjacent portion of Indo-China, in the region drained by the upper reaches of the Mekong river. The party was badly handicapped for want of a capable and trained man in charge, and this explains the poor results obtained. The following localities are referred to in this paper.

UTARADIT, in central Siam.

NONG NAM PI, NA KRAM, BAN SIEW, PAK TAH, CHET TON, on the caravan route between Utaradit and Pak Lai. The road crosses a range of hills, the highest point of which is reached near Chet Ton, about 1800 feet altitude. Pak Lai or Pak Lay is in French Laos, on the Mekong river (Lat 18° 15′ N.).

BAN PAK TUNG on the Mekong, N. of Pak Lai.

BAN MANAO, on the Mekong, N. of Saniaburi (Lat. 17° 50′ N.).

BAN NUA, BAN NA AN, BAN NA SAO, to the E. of Saniabouri. From Hin Boon, to the south of this town, a caravan road runs N. E. to Vinh on the gulf of Tonkin. The route crosses a range of hills, and at its highest point is about 1,000 feet above sea level. The country there is described as "high mountains, no jungle, but rocks and tall grass." Eds.].

The collection consists of 165 specimens and is only poorly representative of the rich Odonate fauna of the region visited. As proof of this, I need only mention that there is not a single species present of the large subfamily *Gomphinae*, and there are only 6 representatives of the whole of the suborder *Zygoptera* which form fully 50 per cent of the Odonate fauna of the region. It is obvious that the native collector passed over the smaller species as unworthy of collecting (there are only 2 specimens of *Coenagrioninae*), and for the rest he took those most calculated to attract his attention by reason of their striking colours or size. The *Corduliinae*,

Aeshninae, Gomphinae, Libellaginae (except for a specimen of *Micromerus lineatus*) are all unrepresented.

1. Potomarcha obscura Ramb.

A female from Na Kram, which is brightly coloured as in the wet season forms.

2. Orthetrum sabina Drury.

2 males and a female from Ban Siew.

3. Orthetrum pruinosum Burm.

1 female from Bang Pak Tung, and 2 males from Na Kram.

4. Crocorthetrum smithii, sp. nov.

A single male from Chet Ton, Jan. 1, 1920.

Length of hindwing 34 mm. Abdomen 28 mm.

Head comparatively small; eyes moderately contiguous; occipital plate large; frons flattened in front and shaped as two horse-shoe shaped areas separated by the suture which is deep. The eyes are blood red, paler below, the face dark ochreous and blood red on the frons and above, as is also the vesicle. Occiput dark reddish brown.

Prothorax with a very large posterior lobe which is fringed with long hairs. Reddish brown.

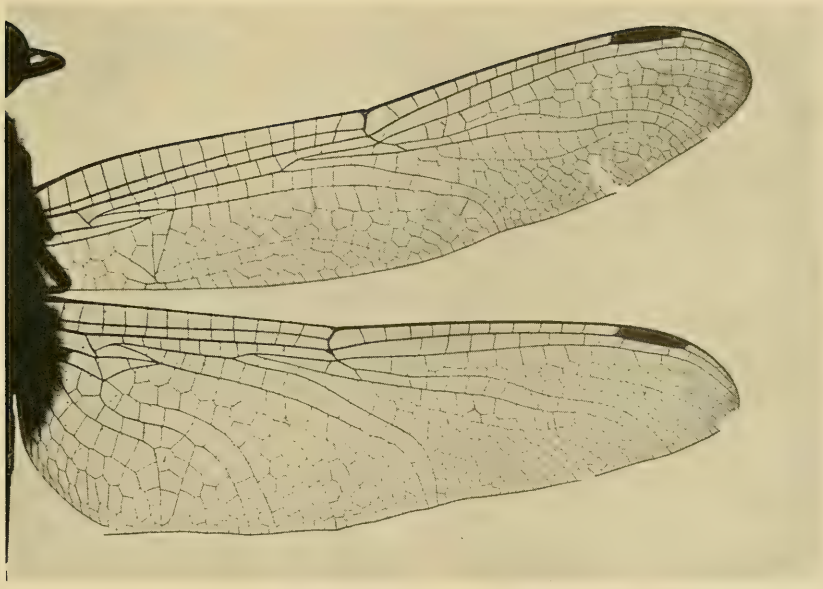
Thorax moderately robust, almost naked save on the front of dorsum, colour a golden, reddish brown.

Legs reddish, distal ends of femora and tibiae black; hind femora with a row of short, robust, moderately closely set and gradually lengthening spines; mid femora with fewer but longer spines. Tarsal claws robust, situated nearest the apex.

Abdomen dilated dorso-ventrally at the base, triquetral, tapering from base to apex, bright crimson without markings.

Anal appendages reddish, the superior as long as the 9th abdominal segment, inferior shorter, excavate above at the base and with two minute points at the end, the rudiments of a fissure.

Genital organs; lamina depressed, fringed with stiff, short, golden hairs. Its outer surface furnished with two long tufts of hair the ends of which are a little recurved; internal hamules blunt, strongly curved, converging hooks; external hamules small, flattened and not over lapping the lobe; lobe subquadrate, small.



F. W. CAMPION PHOTO.

Crocorthetrum smithi.

Wings hyaline, the extreme apical margin a little enfumed, the bases saffronated deeply in the forewing for about halfway to the 1st antenodal nervure, and in the hindwing to the 1st antenodal nervure and line of midrib of loop, extending back nearly to the anal angle.

Stigma dark reddish brown, over about 2 cells, equal in both wings, 3 mm; membrane dark grey; arc between the 2nd and 3rd antenodal nervures; trigone in the hindwing a little proximal to the arc; both trigones traversed once; costal side of trigone in forewing shorter than half the proximal; subtrigone 3 cells; discoidal field with 3 rows of cells as far as the node, widely dilated at the termen; *Cui* strongly convex; 1 cubital nervure in the forewing, 2 in the hind; all hypertrigones except that of the right hindwing traversed once; 2 rows of cells between *Rs* and *Rspl*; no supplements to the bridge; sectors of arc shortly fused in the forewing, a longer fusion in the hindwing; 15 antenodal nervures in the forewing, 10 postnodals; loop well developed, long and narrow, extending 3 cells beyond the outer angle of trigone.

Crocorthetrum smithi resembles a *Crocothemis* superficially, but the large size of the posterior lobe of the prothorax and the position of the arc place it in very near relation to *Orthetrum*. The 2 cubital nervures in the hindwing will serve to distinguish it at once from any species of the latter genus. (I overlooked it at first examination, having mistaken it for *Crocothemis servilia* which it much resembles).

Type specimen deposited in the British Museum.

5. Palpopleura sexmaculata Fabr.

2 females from Na Kram. These do not differ from type.

6. Diplacodes trivialis Ramb.

3 males and 2 females from Na Kram. 2 females from Nong Nam Pi and Ban Siew respectively.

7. Neurothemis tullia tullia Drury.

A single female from Na Kram.

8. Neurothemis fulvia Drury.

1 pair from Na Kram, 1 male from Ban Siew, and 1 male from Ban Nua.

9. Neurothemis intermedia intermedia Ramb.

8 males and 4 females from Ban Manao, Ban Nua, Ban Na An and Ban Na Sao.

10. Crocothemis servilia servilia Drury.

1 male from Na Kram and another from Ban Siew.

11. Trithemis aurora aurora Burm.

Several of both sexes from Utaradit, Nong Nam Pi, Na Kram and Pak Tah.

12. Trithemis festiva Ramb.

1 male from Na Kram.

13. Brachythemis contaminata Fabr.

2 males from Na Kram.

14. Tholymis tillarga Fabr.

Several of both sexes from Na Kram and 1 male from Nong Nam Pi.

15. Neurobasis chinensis Linn.

4 males and 2 females from Na Kram.

16. Vestalis gracilis Ramb.

Several males and females from Ban Manao, and Ban Na Sao. These do not bear any trace of a dark, apical fascia as in *apicalis*, but I am inclined to consider the former as a teneral variety of the latter.

17. Pseudophaea masoni Selys.

1 male from Na Kram and 2 males from Pak Tah. These do not differ from type. The female of this species is apparently rarely seen, which accords with my experience of other members of the genus.

18. Micromerus lineatus Burm.

The markings on the first 6 abdominal segments vary widely but I regard this as merely an evdence of age, as some compare closely with specimens from Ceylon, whilst others are exactly similar to specimens from Dehra Dun, N. India. The specimens, males and 1 female were all taken at Pak Tah. All the males have a well developed, apical, black marking.

19. Copera, marginipes.

1 male from Nong Nam Pi and a female from Na Kram.

20. Coeliccia membranipes Ramb.

1 male from Na Kram.

It will be seen from the above that dragonflies were only collected from 11 out of the many camps at which the collector stayed, which explains the paucity of the collection.

Examples of all have been deposited in the British Museum.

SOME UNDESCRIBED RHOPALOCERA FROM SIAM.

By

N. D. Riley, F.Z.S., F.E.S. and E. J. Godfrey, B.Sc., F.E.S.

With 4 Plates.

The following descriptions of Butterflies, obtained mainly since the publication of Godfrey's "Butterflies of Siam" in this Journal of 1916, are issued as a preliminary to a revised list of Siamese Butterflies which it is hoped to publish before long. The whole of the material collected up till March 1920 has been overhauled afresh, so that it is hoped that any errors which may have crept into the first list will be rectified in the next.

Most of the new forms, it will be noticed, are from the Me Song forest, N. Siam, a few from S. E. Siam, and one only from Peninsular Siam. One interesting fact has been frequently brought out in going through the collections, namely, the considerable difference between the fauna of Northern and Western Siam and that of S. E. Siam. Of the forms described below, only one (*Allotinus posidion*) of the five from Eastern and S. Eastern Siam has been met with in any form in North and West Siam so far, nor have any of those described from the Me Song forest, with the exception of *Penthema binghami mimetica*, been met with in any other part of Siam. It is hoped soon to draw up a table shewing the distribution, so far as ascertained, of the Butterflies of Siam, using the divisions adopted in the previous paper, when the very real faunistic differences of these areas will be more obvious.

All the Types of the forms here described as new, as well as the Types of those described in the previous paper have been presented to the British Museum (Natural History), together with a short series of practically every species so far obtained in Siam.

We take this opportunity of figuring the following forms already described in the previous paper in this Journal:—

Gerydus ancon siamensis Godfrey. (Plate V, figs. 8 and 9.)

Terinos terpander intermedia Godfrey. (Plate VII, figs. 2 and 3.)

Everes rileyi Godfrey. (Plate VII, figs. 4 and 5.)

Hestia leuconoe siamensis Godfrey. (Plate VII, fig. 6.)

and also

Thauria lathyi siamensis Rothschild. (Plate VII, fig. 1.)

All the figures have been drawn from the actual Type specimens by Miss O. F. Tassart. By an unfortunate error of the printers, these have, in the process of reproduction, been reduced in size, those in Plates IV, V and VII, to approximately 4/5ths., and those in Plate VI to approximately 9/10ths. the natural size.

PAPILIONIDÆ

1. **Papilio laos**, sp nov.

(Plate IV, fig. 1.)

♂. *Upperside, forewing.*—Dark shiny blue-black, immaculate, the distal half of costal area lighter, slightly greenish, the internervular and cellular rays darker, not very conspicuous. *Hindwing.*—Not so dark (except the cell and towards the base of the wing), tinged with greenish. There are pink bilunulate submarginal spots present in areas 2 and 3, extending right across these areas, in area 4, incomplete, and in area 5, almost obsolete, each densely irrorated with black scales and bordered outwardly by an indistinct quadrate dark blue-black spot reaching the margin, and inwardly surmounted by conical spots of the same colour. The cottony lining of the abdominal pocket is very pale ochreous, almost white. There are traces of pink scaling inwardly at the tips of the conical dark spots referred to, in areas 2 and 3, and at the distal end of the abdominal fold.

Underside, both wings.—As above, except that the *forewing* is dull blue-black not shiny, and paler than the hindwing, so that the internervular and cellular rays are more conspicuous; and that in the *hindwing* the pink spots are more fully developed and free of dark scaling , and consist of a submarginal series of 5 spots, i. e., in areas 2 to 6, and a discal series of four crescentic spots in areas 2 to 5, that in area 5 being minute, the others increasing in size progressively. In each series the spot in area 2 overflows into area 1*c*, the submarginal one only slightly, the discal one very considerably. The ground-colour of the hindwing is nearly uniform on the underside, the greenish tinge being confined to costa and hind-margin and the extremities of the veins.

Head clothed with red hairs tipped, except above, with black.

Thorax black except below close to the wings, where it is red. Abdomen red, spotted laterally with black, shiny blue-black above.

Length of forewing.—57 mm.

B. M. Type No. Rh. 114, ♂, Ban Na Sao, French Laos, 23. 2. 20.

This species, of which only the single male described is at present known, has the size, build and shape of *P. alcinous* Klug. It has, however, a smaller tail, it lacks the usual grey appearance, especially of the underside, of that insect, and the lining of the abdominal fold is almost white, resembling *P. plutonius* Oberthür. Also the spots, especially of the underside, of the hindwing are more numerous and much more irregular in outline.

The Type specimen was taken by a Siamese collector and, at the time the description was written at the British Museum, it was thought that Ban Na Sao, the type locality, was in Siamese territory. Subsequent enquiries have shown that this is not so—Ban Na Sao being actually in French Laos, E. of Saniabouri, about 40 miles from the Siamese frontier.

PIERIDÆ.

2. Delias agoranis H. G. Smith.

Delias agoranis, H. G. Smith, Ann. Mag. Nat. Hist. (5), xx, p. 226 (1887).

Piccarda agoranis, Moore, Lep. Ind. vi, p. 182, pl. 535, figs. 2, 2a (1905).

Delias agostina, race *agoranis*, Bingham, Fauna Br. Ind. Butt. ii, p. 147 (1907).

Delias singhapura agoranis, Fruhstorfer, in Seitz Macro-lep., ix, p. 124 (1910).

As the above references indicate, this species has been somewhat unfortunate in its treatment by recent authors. We consider it a good species, equally distinct from both *singhapura* and *agostina*, though certainly somewhat intermediate in some respects between the two. Our specimens agree perfectly with Moore's figure which was made from the Type specimen.

Singhapura has the veins of the underside of the hindwing heavily marked with black; this is entirely absent in *agoranis*. *Agostina* is similarly devoid of this black veining, but then it has a

narrow, even, black marginal border to the hindwing below enclosing long narrow rectangular white marks. In *agoranis* this border is more than double the width, runs up in conical projections along the veins and encloses oval or circular white patches. In *singhapura* the enclosed spots are still larger, frequently divided in two by a narrow black line, semi-circular in shape, reaching from vein to vein and cut off squarely by the veins.

NYMPHALIDÆ.

Satyrinæ.

3. **Mycalesis siamica,** sp. nov.

(Plate IV, figs. 2 and 3.)

♂. *Upperside, forewing.*—Dark brown with two parallel narrow darker marginal lines, the markings of the underside (principally the lighter marginal area and the paler subapical bar) showing through. In area 1*a*, rather towards the base, is a large dull purplish shiny area, and above this, in area 1*b* close to vein 1 which curves below it, a single pencil of hair, its free end resting in a small oval patch of dark shiny scales. There is a further sex-mark in area 3 in the form of a diffuse mealy patch of dull ochreous scales, just reaching the edge of the lighter marginal area. *Hindwing.*—Slightly darker than the forewing, underside markings not showing through so conspicuously, marginal lines the same as in forewing. Darker towards costa, velvety. A dark brown pencil of hair arises near the base of cell and curves slightly towards costa, so as to lie along the nearly white oval patch of scales towards the base of area 7.

Underside, both wings.—Very dark velvety brown, lighter basally, margins broadly silvery grey, marginal lines as above. *Forewing.*—The marginal silver-grey band, lightest in areas 4 to 6 proximally (the subapical bar of upperside mentioned above), is broadest on the costa. Its inner edge extends in an almost even gentle curve from costa just before end of vein 12 to centre of area 4, where it is rather sharply angled and runs almost straight and parallel to the margin, to vein 2, thence inwardly slightly to vein 1, where it merges into the shiny inner-

marginal area. Enclosed in the band are ocelli in areas 2 (the largest), 3 and 4 (minute), and 5 and 6 (larger), those in 2 to 5 in line, that in 6 inward. There is an additional wavy antemarginal line, removed some 3 mm. from apex at costa, but closely approximating to the marginal lines in area 1*b*, and the area between this wavy antemarginal line and the margin has a slight ochreous tinge. *Hindwing.*—The lighter marginal band darker grey than on forewing, conforming more to the shape of the margin, darkest posteriorly, and enclosing seven ocelli, i. e., two in area 1*b*, one each in areas 2 to 6. Of these, that in area 2 is the largest, those at either end the smallest, the remainder subequal, and all are arranged in an even curve except for that in 3, which is set slightly inwards. Antemarginal band as in forewing, most widely separated from margin in areas 1*b* and 5, the area beyond tinged with ochreous.

♀. *Upperside, both wings.*—Like the male, but larger and lighter in colour, the underside markings more conspicuous above. *Forewing.*—The subapical white bar is present on upperside, diffuse, extending from costa into area 3, about 2.5 mm. broad, straight, the ocellus in area 2 present above. Margin lighter. *Hindwing.*—Margin pale ochreous, except towards anal angle.

Underside, both wings.—Exactly like the male but paler.

In both sexes the body, thorax and head, above and below, conform to the colouration of the base of the wings. Antennae slightly orange below towards the tip.

Length of forewing.— ♂ 22 mm; ♀ 24.5 mm.

B. M. Type No. Rh. 117, ♂; 118, ♀, Me Song forest, Prae, N. Siam, April 1918.

In addition to the Types, nine males and three females were obtained in the same locality in April 1918 and three females in April 1916.

4. Ragadia critias, sp. nov.

(Plate IV, fig. 4.)

♂. *Upperside, both wings.*—Very dark brown, almost black, basally paler, the markings of the underside showing through. *Forewing.*—A creamy white transverse oblique discal band from

area 5, where it is from 1 to 1.5 mm. wide, to inner margin just beyond middle, where it is about 2.5 mm. wide; traces of a similar much narrower antemarginal band run very indistinctly through areas 1*a* and 2; both bands are interrupted by the darker veins, especially anteriorly, and the outer edge of the discal band is somewhat sinuate. *Hindwing.*—The transverse band of forewing is continued across hindwing, its outer edge rather irregular, tapering towards inner margin and curving slightly towards, but not quite reaching, anal angle; this band is separated by a wide band of the ground-colour from the irregular curved antemarginal white band, from 1 to 1.5 mm. wide, which runs from apex almost to anal angle, and is widest centrally and posteriorly. A single tuft of jet-black hairs lies in an oblique pocket towards base of cell.

Underside, both wings.—As above. *Forewing.*—In addition, having the transverse band extending to area 7, where it becomes reduced to a point, and having two very pale grey narrower transverse bands roughly paralled to it and at regular intervals between it and the base of the wing. The swollen part of vein 12 is similarly coloured, the submarginal band is fully developed, narrow, extending from vein 1 to vein 6, and there is a similar very fine marginal line. The dark band of ground-colour separating discal and submarginal bands bears ocelli in areas 1*a* (double), 2 to 7 (one each), making seven in all. Of these that in area 7 is minute, while the remainder are all of much the same size, but become more and more indistinct posteriorly. The *hindwing* repeats the pattern of the forewing, the basal and sub-basal bands slightly broader than the corresponding bands of the forewing, the marginal and submarginal bands fully developed, the former threadlike at its extremities and just uniting with the ends of the submarginal band, thus enclosing a long narrow crescent of the ground-colour. The broad discal band of ground-colour interior to this bears only five ocelli, of which the two in area 1*b* are the smallest and are united, those in areas 2 and 6 are larger and equal in size, whilst that in area 4 is very large, simple, and extends considerably into areas 3 and 5 on either side.

♀. *Upperside, both wings.*—Paler brown than in the male,

the wings more rounded, the submarginal band of *forewing* not obscured in areas 1*a* and 2. *Underside.*—Pale markings somewhat more developed, the very large ocellus in area 4 of *hindwing* partially fused with that in area 2. Otherwise as in the male.

Length of forewing.—♂ 20 mm; ♀ 21 mm.

B. M. Type No. Rh. 115, ♂; 116, ♀, Nam Pat, 36 miles E. of Utaradit, N. E. Siam, Jan. 1920.

This species is separable at once from *R. crisilda* Hewitson, *R. critolaus* and *R. cristata* de Nicéville, its nearest allies, by the number of the ocelli on the underside of the hindwing. In *crisilda* there are invariably seven, those in areas 3, 4 and 5 being fused; in the other two species there are six, that in area 3 being absent, and those in areas 4 and 5 fused. In *critias* there are only five. The broad dark discal band of hindwing which bears the ocelli is much broader in *critias* than in either of de Nicéville's species, and is bordered externally by a much better defined white band than in *crisilda.*

MORPHINÆ.

5. Stichophthalma cambodia editha, ssp. nov.

(Plate IV, fig. 5.)

♂ ♀. *Upperside both wings.*—Similar to *S. c. cambodia* Hewitson, but with the discal pale area rather more extensive, brighter and clearer, less sprinkled with brown scaling; the V-shaped marks in the discal series narrower, the tips not recurved, and each mark with a small conical median projection basad, making the marks more dagger-like in shape; the antemarginal smoky-brown lunules reduced in size and almost surrounded by the pale discal colouration, except towards apex of forewing. In the female of *editha* the large proximal extension of the V-spot in area 6 (typical of *cambodia,* the Type of which is a female) is partially suffused with bluish white scales, and has a white spot in the centre, whilst in the male it is absent altogether.

Underside, both wings.—Considerably paler than in typical *cambodia.* In the male the *forewing* has the basal half reddish grey-brown, bordered by a narrow band of white, the latter broader

towards costa; between this white band and the two red-brown ocelli (of which that in area 5 is almost obsolete) is a diffuse band of same colour as the base of the wing; beyond this the general colouration is pale buffy, the upperside markings faintly showing through, darker towards margin. In the *hindwing* the ground-colour is more uniform, the same shade as base of forewing, the transverse white band and the area immediately external to it almost completely suffused with blackish, the distal half of wing rather redder than basal half. Markings as in *cambodia*. The female differs from the typical female in being lighter, clearer and more of a chestnut-brown in general colouration, in having the transverse white band of both wings considerably broader and in the hindwing hardly at all suffused with black, and the outer area of forewing considerably lighter than that of hindwing. The ocelli in both sexes are more narrowly ringed with black than in typical *cambodia* and have an additional outer narrow ring of light grey.

Length of forewing—♂ 61 mm; ♀ 65 mm.

B. M. Type No. Rh. 119, ♂; 120, ♀, Khao Sebap, near Chantabun, S. E. Siam, March 1916.

S. cambodia was described by Hewitson in 1862 from the single female which is now in the British Museum, and which is still unique. Fruhstorfer in Seitz Macro-lep., ix, p. 425, suggests that it may be only a form of *S louisa* Wood-Mason. However, the occurrence in Siam of *S. louisa siamensis*, recently described by Lord Rothschild (Nov. Zool. xxiii, p. 308, 1916), together with the above described race of *S. cambodia*, establishes beyond doubt the validity of the species.

In describing the subspecies we have had no male of typical *cambodia* for comparison, the female alone being known, but the females before us, as explained above, are so sufficiently distinct from the female Type of *cambodia* as to warrant our belief that *editha* will prove to be a good subspecies.

NYMPHALINÆ.

6. Penthema darlisa melema, ssp. nov.

(Plate V, fig. 1.)

♂. Very similar to typical *darlisa*, but smaller, the white markings of forewing and the straw-coloured markings of hindwing slightly reduced in size, especially the latter. The bluish suffusion of forewing less pronounced, giving the insect a much browner appearance. The underside shows a corresponding difference.

Length of forewing.—55 mm. (the Type of *darlisa* measures 67 mm.).

B. M. Type No. Rh. 122, ♂; Me Song forest, Prae, N. Siam; April 1918.

This race should be readily recognisable by the characters given. The reduction in size of the lighter markings is particularly noticeable in the basal half of the hindwing. It was obtained in some numbers in the Me Song forest, during April 1916 and April 1918.

7. Penthema binghami mimetica Lathy.

(Plate V, fig. 2.)

Penthema mimetica, Lathy, Entomologist, xxxiii, p. 213 (1900).
P. darlisa mimetica, Fruhstorfer, in Seitz Macro-lep., ix, p 464 (1912).

P. mimetica was described by Lathy from a single female which came from Pak Jong, Central Siam, and which is now in the Adams Coll. in the British Museum. A second female was obtained at Hup Bon, S. E. Siam, in April 1914 and since then a number of males have been taken in the Me Song forest, Prae, N. Siam.

Fruhstorfer (*l. c.*) regards *mimetica* as a form of *P. darlisa* which he treats as a species dimorphic in both sexes. An examination of the genitalia of these two forms, *P. d. melema* and *P. b. mimetica*, however, entirely contradicts this view. Though superficially alike, actually these structures are very distinct in the two forms. In each species the *uncus* terminates in a long spike directed downwards almost at right angles to the long axis of the body. Slightly proximal to this there arises a pair of spines, not very close together, and running parallel to each other and to this terminal spike, their tips directed posteriorly. In *melema* these are very

nearly equal in length to the terminal spike of the *uncus;* in *mimetica,* on the other hand, they are decidedly more delicate and only about 2/3rds the length of the terminal spike. In each species also the clasp ends in a spike-like process which in *melema,* in proportion, is quite twice the size of that in *mimetica,* and also less clearly differentiated from the broad upward-curving anteterminal part of the clasp from which it arises. This latter part as well exhibits a difference in that it is broader and stumpier in *mimetica,* evenly tapering in *melema.* As a corollary to this it seems reasonable to suppose that typical *binghami* and *darlisa* are similarly distinct species; and, occuring together as they undoubtedly do, that they stand in the same relationship to each other in Burma as do *mimetica* and *melema* in Siam.

8. Cirrochroa chione, sp. nov.

(Plate V, fig. 3.)

♂ *Upperside, forewing.*—Basal two-fifths brown, bounded by a slightly darker irregular line running from near costa, 2 mm. beyond cell-apex, to just beyond centre of vein 1, gently angled in area 2 (in another specimen the course of this line is rather more even). Costal area of same colour as base, the colour extending beyond edge of basal brown area, a darker shade across end of cell. Apex very broadly, and hind-margin (towards anal angle more narrowly) black, the inner edge of this black border curving roughly parallel to the outer edge of the basal brown area and just reaching to middle of costa. The intermediate discal area is golden-brown in the form of a wide even band cut off from the costa only by the narrow strip of apical black which reaches to middle of the costa. There are traces of an antemarginal series of darker spots in areas 1*a* and 2, and of a submarginal line in area 1*a*. *Hindwing.*—Of the same colour as the base of forewing, rather brighter towards hind-margin. There is a subquadrate white spot centrally in area 7, inwardly edged with black, from the outer edge of which runs a very fine direct irregular black line finishing at vein 1*a* about 5 mm. above margin. Between this and the marginal black border, which throughout is about 1.5 mm. wide, are, firstly, a series of six

small black spots, there being none in area 4, secondly, a series of seven crescentic black marks reaching from vein to vein and nearly touching each other and, thirdly, a heavy black wavy line fusing with the marginal border at each end. Abdominal area grey.

Underside, both wings.—Pale ochreous, the markings of the upperside represented by brown. A narrow transverse wavy line crosses cell of *forewing* obliquely to origin of vein 2, thence to inner margin, and is continued interruptedly across hindwing as far as vein 1*a*. A very well-defined narrow straight black line starts at origin of vein 7 of forewing and runs uninterruptedly to anal angle of hindwing, is diffusely edged outwardly with brown, more particularly on hindwing, and bordered inwardly, on hindwing only, as far as the irregular transverse discal line, with dull mother-of-pearl. The forewing has a small oval apical patch of lilac-grey.

The veins on upperside are throughout delicately black, those of forewing, and veins 5, 6 and 7 of hindwing being, in addition, edged with golden.

Length of forewing.–32 mm.

B. M. Type No. Rh. 121, ♂, Khao Sebap, Chantabun, S. E. Siam, March 1916.

On the upperside the markings of *C. chione* much resemble those of *C. orissa*, but the light discal band is curved, not straight as in that species, and the basal dark area is bounded by a well-defined dark line. The markings of the hind-margin of the hindwing and of the underside are however very different, the latter more nearly resembling in arrangement those of *C. surya*, *C. aoris* and *C. malaya*.

9. **Neptis cartica meraca**, ssp, nov.

(Plate V, fig. 4.)

♂. Most closely resembles the subspecies *burmana* de Nicéville, in the absence of brown suffusion of its white markings. With the exception of the longitudinal streak on the forewing, which is distally slightly cloudy, these are entirely pure white. They are however much smaller than in *burmana*, being approximately the size of those in typical *carticoides* Moore. The underside colouration

is as in *burmana*, the white markings reduced as above.

B. M. Type No. Rh. 136, ♂, Me Song forest, Prae, N. Siam, April 1918.

A very distinct race. This species may always be readily separated from those to which it bears a close resemblance on the upperside, such as *N. soma* and *N. nandina*, by the absence of the sub-basal streak, coupled with the far greater width of the basal streak on the underside of the hindwing.

10. Euthalia monina grahami, ssp. nov.

(Plate V, figs. 5 and 6.)

♂. Separable at once from *E. m. perakana* Fruhstorfer, its nearest ally, by its larger size and the replacement of the broad distal bluish-green band of hindwing upperside by a completely bronze-green band, the anal angle alone showing some slight tinge of bluish. In *perakana* such green as is present is confined to the proximal half of this marginal band. The forewing also, especially costally, basally, along the veins and distally in areas 1*a* to 3 strongly bronze-green. Below, the ground- colour is a clearer brown than in *perakana*, the discal dark markings more pronounced.

♀. Dark markings of both surfaces as in *perakana* female, but not so heavy. Light markings larger, especially on hindwing, and paler.

Length of forewing.—♂ 29 mm ; ♀, 35 mm.

B. M. Type No. Rh. 123, ♂ ; 124, ♀, Patani, Peninsular Siam.

This new race of *E. monina* is particularly interesting, not only on account of its being so very distinct, but also because it appreciably extends the known range of the species. It has not previously been recorded as occuring north of Perak, so far as we can ascertain.

The Types, and only known specimens, were obtained by Mr. W. A. Graham and by him presented to the British Museum.

RIODINIDÆ.

NEMEOBIINÆ.

11. Laxita telesia boulleti Fruhst.

(Plate V, fig. 7).

Laxita boulleti, Fruhstorfer, in Seitz Macro-lep. ix, p. 790 (1916).

Described by Fruhstorfer *(l. c.)* as a distinct species, of which he only knew the female Type in the Paris Museum. A single male specimen obtained in the Me Song forest, Prae, N. Siam, in April 1918 seems undoubtedly to be the male of this race. The specimen resembles *L. t. lyclene* de Nicéville, but differs in having the apical red of forewing above much wider, and the white patch towards inner margin nearly twice as large. Unfortunately the specimen is so damaged that it is impossible to be sure of the shape of the hindwing. The basal and sub-basal markings are wanting, as is said to be the case in the female described by Fruhstorfer, and the other black markings are much reduced throughout as compared with *lyclene*. In addition, the markings which in that form are bluish, are in *boulleti* rather greenish, the discal markings of hindwing more approximated to cell, and the marginal and submarginal bands narrower.

Whilst very distinct from typical *telesia* Hewitson, we do not consider *boulleti* worthy of more than subspecific rank, and therefore treat it as a race of *telesia*.

B. M. Type No. Rh. 137, ♂, Me Song forest, Prae, N. Siam, April 1918.

LYCÆNIDÆ.

GERYDINÆ.

12 Gerydus ancon siamensis Godfrey.

(Plate V, figs. 8 and 9.)

Journ. Nat. Hist. Soc. Siam, ii, p. 134, 1916, ♂.

♀. In addition to the pronounced sexual differences in the shape of the wings etc., usual to the genus, has the pale area at the end of forewing cell developed to form an irregular diagonal transverse band, reaching from very near costa to vein 3 close to the round white spot in area 2 distally. The ground colour of both wings is a richer brown, not so grey as in the male. Below, the general tone is rich ochreous, forewing markings as above, hindwing with the short discal smoky band strongly developed.

Length of forewing.— 23 mm.

B. M. Type No. Rh. 145, ♀, Me Song forest, Prae, N. Siam, April 1916.

The male only of this was known to, and described by Godfrey *(l.c.)* from Muak Lek, E. Siam. Some 5 males and 6 females since obtained in the Me Song forest confirm the opinion then formed that this is a very distinct race of *G. ancon.*

13. Allotinus posidion rekkia, ssp. nov.

(Plate VI, figs 1 and 2.)

A. horsfieldi continentalis, Godfrey [*nec* Fruhstorfer], Journ. Nat. Hist. Soc. Siam, ii, p. 135 (1916).

♂. Differs from *A. p. atacinus* Fruhstorfer (in Seitz Macrolep. ix, p. 811, 1916) by its blacker tone and by having the sex-mark at the base of vein 4 smaller and even less clearly differentiated from the ground-colour.

♀. Hardly separable above in markings from Burmese *atacinus*, the colouration, however, is paler and more greyish. This applies equally to the underside.

Length of forewing.—♂, 16 mm; ♀, 14.5 mm.

B. M. Type No. Rh. 125, ♂, Muak Lek, E. Siam, 7. 1. 14.

B. M. Type No. Rh. 126, ♀, Pak Jong, E. Siam, 4. 1. 15.

This species was previously recorded in error by Godfrey (*l. c.*) as *A. horsfieldi continentalis* Fruhstorfer. This latter species, which so far is not known from Siam, is at once separable from *rekkia*, as in it veins 6 and 7 of forewing arise separately and directly from cell-end, whereas in *rekkia* they are stalked for some distance. *A. posidion* Fruhstorfer, closely resembles *A. horsfieldi* Moore, but throughout its range is consistently smaller.

14. Allotinus drumila grisea, ssp. nov.

(Plate VI, fig. 3.)

♀. *Upperside, forewing.*—White, basal third grey-brown merging distally into the white ground-colour, extending slightly into area 2, and divided in cell by a conical projection of the white ground-colour directed towords the base. Apex very broadly, inner angle less so, and hind-margin wholly black. Fringes red-brown. *Hindwing.*—Entirely suffused with grey; costal area black.

Underside.—As in typical *A. drumila* Moore.

B. M. Type No. Rh. 127, ♀, Me Song forest, Prae, N. Siam, April 1918.

Readily distinguished from typical *drumila* by the completely grey hindwing and the greatly increased grey-brown suffusion of base of forewing.

LYCÆNINÆ.

15. Talicada metana, sp. nov.

(Plate VI, fig. 4.)

♀. *Upperside, both wings.*—Dark sooty brown, the fringes chequered black and white. *Forewing.*—Costal edge finely marked with white. *Hindwing.*—A broad orange band extends from anal angle to just short of vein 6, its inner edge slightly concave, its outer edge bounded in areas 1*b* and 1*c* by a very fine black marginal line, and in areas 2, 3 and 4 by basally contiguous triangular black marks the apices of which project into the orange.

Underside, both wings.—White, fringes as above. *Forewing.*—A heavy black mark crosses cell-end; beyond this, and rather more than half-way to hind-margin, there is a transverse series of six heavy black roundish spots, in areas 1*b* to 6, curving slightly so that the spot in area 2 is nearest the base, that in area 4, which is also the longest, is the furthest removed and in fact fuses with the corresponding spot in the antemarginal series. This latter series consists of a complete row of black triangular spots, their bases much fused together, their apices produced along the veins as lines which extend to the very narrowly black margin. In each of the white spots of ground-colour so enclosed there is a small black lunule close to the margin, those in areas 1*b* and 1*c* together forming an oblong mark proximal to which the enclosed white area is sprinkled with orange. *Hindwing.*—Arrangement of markings similar to that of forewing but the spots of the antemarginal series, except in areas 6 and 7, orange not black, the inner edge of the series very wavy, the enclosed spots of the marginal series increasingly larger from costa towards anal angle, but at anal angle smaller and partly orange. The black spots of the post-discal series much smaller than those of forewing, especially in areas 1*b*, 3, 4 and 5, where they are reduced

to mere dots, in places partially merged into the orange antemarginal series. In addition there is a roundish black spot near the base of area 7, touching vein 8, but only extending little more than halfway across area 7 towards anterior margin of cell.

Length of forewing.—15 mm.

B. M. Type No. Rh. 127, ♀, Me Song forest, Prae, N. Siam, April 1918.

The anteriorly jagged-edged and very much narrower orange terminal band of the hindwing above and, on the hindwing below, the absence of most of the basal and discal black markings together with the substitution of black for orange in the marginal series, readily distinguish this species from any of the forms of *T. nyseus* Guérin, with which we are acquainted.

16. Azanus urios, sp. nov.

(Plate VI, fig. 5.)

♂. *Upperside, both wings.*—Rich shiny purple, the cilia grey-brown but whitish towards apex. *Forewing.*—Hind margin broadly dark brown, broadest at costa; the whole of the disc of the wing covered by a silky patch of modified scales. *Hindwing.*—Costal area completely, and outer margin very broadly, dark brown.

Underside, both wings.—Rather dark brown. *Forewing.*—Two minute black light-ringed spots just below costa, one slightly before, the other rather further beyond cell-end; a broad mark across cell-end, a discal series, interrupted at vein 3, and a smaller and fainter antemarginal series, are all composed of oblong spots slightly darker than ground-colour and edged internally and externally with light grey. In addition there is a marginal series of oval rather darker spots and a dark brown anteciliary line. *Hindwing.*—Similar to forewing, but the spots in the discal and antemarginal series smaller and less regularly arranged, the costal black spots much larger, the proximal one much nearer the base. In addition there is a sub-basal series of the small black spots, a larger black anal spot and a very much larger internally orange-bordered black spot in area 2, resting on the margin.

Length of forewing.—11.5 mm.

ERRATUM.

Page 182, line 16 from bottom. *After the word* dark-brown *add*:—enclosing a darker spot in area 2; abdominal area light grey.

B. M. Type No. Rh. 129, ♂, Me Song forest, Prae, N. Siam, 17. 4. 1916.

Another specimen was obtained in the same locality on the following day, whilst a third is in the British Museum from Tilin Yaw, Upper Burma, 17. 4. 90, collected by Watson.

This species has points of resemblance to both *A. uranus* Butler, and *A. ubaldus* Cramer. From the former it can at once be separated by its very broad dark margins and the darker tone of its underside, although it agrees very closely with it in underside markings. From the latter it can as easily be distinguished, apart from the colouration of the upperside and the more rounded shape of its wings, by the absence of any trace of the basal streak on the underside of the forewing. It is also slightly larger than normal examples of the other two species mentioned.

ARHOPALINÆ.

17. Arhopala dispar, sp. nov.

(Plate VI, fig. 8.)

♂. *Upperside, both wings.*—Bright lilacine blue. *Forewing.*—A darker transverse mark at end of cell, the central area of wing paler, almost white in parts. *Hindwing.*—Costal area dark brown, marginal areas shaded with brown, tails dark brown, abdominal areas white.

Underside, both wings.—Ground-colour dark shiny brown with a faint dull purplish tinge. *Forewing.*—Areas 1*a*, 1*b* and 2 almost pure white; the three cell spots, costal spot and anterior part of transverse band all large and very dark brown, ringed or bordered with white; remaining spots also large but paler; the spots of transverse band oblong, the uppermost one reaching the costal spot (above cell-end), the next three in a regular row, very close to the third (distal) cell-spot, the two below, in areas 3 and 2, moved inwards so that the upper one touches the third cell-spot and also its extension in area 3; a large spot fills the base of area 2, and a very large irregular spot in area 1*b* extends from base to well beyond origin of vein 2; there is a shadowy submarginal series of spots slightly darker than the ground-colour and relieved with grey either side. *Hindwing.*—The costal basal spot, the basal row of four spots, of which the

third is oval and the fourth, and lowest, much the innermost, and the median row of three larger spots, of which the lowest is very long and lanceolate, are all very much darker brown than the ground-colour and very clearly ringed with white. The broad irregular spot at end of cell and the spots of the discal series are slightly paler. The latter is interrupted at veins 6, 4 and 2, and has the spot in area 1*c* V-shaped, that in area 1*b* very long, lanceolate, nearly reaching the lowest spot of the basal series. There is a darker rather indefinite wavy grey-edged submarginal line and a marginal series of very indefinite brown crescentic spots in areas 6 to 3, continued by a similar but black spot in area 2, a large round black spot heavily blue-scaled in area 1*c* and a much smaller one only slightly bluish in area 1*b*. A conspicuous feature is the replacement of the ground-colour in the whole of area 6 and in the adjacent distal parts of areas 5 and 7 by light greyish.

Length of forewing.—25 mm.

B. M. Type No. Rh. 130, ♂, Me Song forest, Prae, N. Siam, April 1918.

Similar to *A. camdeo* Moore, but smaller, and most readily distinguished by the purplish-brown tint of the underside, the more even colour of the darker markings, which are also in proportion larger than in *camdeo*, the very different shape of the lowest spot of the median series of the hindwing (we use the terminology of Bethune-Baker in his Revision of the Arhopalinae in the Trans. Zool. Soc. London, 1903), and the whiteness of the inner-marginal area of forewing and of area 6 of the hindwing.

Another male, which we consider to be a form of this species, was taken at the same time and place as the Type, but differs in being of a rather brighter blue above and very much lighter and less heavily marked below. The differences given above, however, serve equally well to separate it and the Type of *dispar* from *A. camdeo* Moore, with the Type of which both specimens have been compared.

18. Arhopala opalina (Moore).

(Plate VI, fig. 7.)

Nilasera opalina, Moore, Proc. Zool. Soc. London, 1883, p. 531, pl. 49. fig. 1.

Five males and a single female of this rare species were obtained in the Me Song forest, Prae, N. Siam, in April 1918, and as the female does not appear to have been recorded hitherto we give below a short description of it. It is a very close ally indeed of *A. camdeo* Moore.

♀. *Upperside, forewing.*—Basal third clear pale sky-blue, not tinged with lilac or purple as in the male; outer two-thirds much paler, almost white; costa, apex broadly, and hind-margin very dark brown; a conspicuous oblong black mark at end of cell, and a very distinctive subapical series of three oblong black marks, one each centrally in areas 4, 5 and 6. *Hindwing.*—Similar to the male; the outer not so much paler than the basal areas; the costa broadly, hind-margin narrowly dark brown.

Underside, both wings.—Similar to the male, but with the ground-colour paler and the dark markings rather darker and more conspicuous; the basal and median spots in forewing cell normal, not, as in the aberrant male Type, partially fused together.

B. M. Type No. Rh. 131, ♀, Me Song forest, Prae, N. Siam, April 1918.

19. Arhopala andamanica ignara, ssp. nov.

(Plate VI, fig. 6.)

♂. *Upperside.*—Differs only from *A. a. andamanica* Wood-Mason and de Nicéville, in having a very much narrower black margin to the forewing. *Underside.*—Ground-colour a much warmer reddish-brown, the transverse bands more conspicuous, smoky purplish; the four spots of basal row, the lower three of median row and the linear mark across end of cell, faint but visible, smoky purplish.

Length of forewing.—20 mm.

B. M. Type No. Rh. 132, ♂, Me Song Forest, Prae, N. Siam, April 1918.

A short series of this continental form of *A. andamanica* was obtained in the same locality as our Type. There are in addition in the British Museum two specimens, one from Tenasserim (Watson Coll.), the other from Toungoo (Godman & Salvin Coll.). The differences are constant for the nine specimens examined. *A. fulla*

Hewitson, a closely allied species, may be separated at once from *andamanica* by the fact that the two smoky transverse bands of forewing below are widely divergent towards the costa, whereas in *andamanica* they run parallel throughout.

THECLINÆ.

20. Rapala rhaecus de Nicéville.

Journ. Bombay Nat. Hist. Soc. 1895, p. 319, pl. P, fig. 47, ♂.
„ „ „ „ „ 1896, p. 182, pl. T, fig. 40, ♀.

De Nicéville (*l. c.*) very carefully describes and figures both sexes of this very distinct species, and supplements his description of the male with the remarks; "allied to *R. tara*, de Nicév. but the blue colouration of the upperside is quite different, being darker and richer in shade, less iridescent, and in the forewing of greater extent; the sexual patch is also smaller, barely extending into the submedian interspace, in *R. tara* it extends somewhat widely below the first median nervule; the ground-colour of the underside is also quite different."

Swinhoe, however, in Lep. Ind. ix, p. 48, sinks it as a synonym of *R. sphinx* Fab., remarking that "de Nicéville's types of *rhaecus*, which undoubtedly represent this species, came from Sumatra". Incidentally, Swinhoe also states at the same time that the Fabrican type of *sphinx* is in the Banksian Cabinet in the British Museum. This is not the case; not only is the Type not there, there is not even a specimen of the species in the Collection in question.

Fruhstorfer in his Revision of (Eastern) Lycaenidae in the Berliner Ent. Zeit. lvi, p. 197, *et seq.* entirely omits the species.

This is all the more curious as there is no mistaking the species. There are in the British Museum four males: 2 from Sumatra, 1 from Moulmein, Tenasserim, and 1 from Bhutan (G. C. Dudgeon) and one other male has been obtained in the Me Song forest, Prae, N. Siam.

It is in the male abundantly distinct from any other species of *Rapala* with which we are acquainted, as, roughly speaking, it has the underside of *sphinx* and the upperside of *tara*. The male of *rhaecus* has a small very clearly defined sex-mark, triangular in shape, occupying the bases of areas 2 and 3; this is entirely absent

in the male of *sphinx*. This alone separates the males at once without looking any further. Unfortunately we have not yet seen the female.

21. Biduanda cyara (Hewitson).

Myrina cyara, Hewitson, iii, Diurnal Lep. Suppl. p. 26, pl. 3b, figs. 109, 110 (1878).

Hewitson, (*l.c.*, p.6,) describes both sexes of his *Myrina melisa*, and later (p. 26) a specimen, sex not mentioned, of his *cyara*. Of these he figures only the "female" of *melisa* and the specimen of *cyara*. An examination of his Types, in the British Museum, proves his male of *melisa* to be in fact a male, his female of *melisa* a male, and his Type of *cyara* a female.

The errors he committed have unfortunately been followed by most writers ever since, owing probably to the great rarity of the species.

From the above it is evident that Hewitson's "female" of *melisa*, being a male, cannot belong to that species. We consider it in fact to be the male of *cyara*, the undersides agree so very closely. In addition to Hewitson's Types there are in the British Museum: one male from Bhutan taken by G. C. Dudgeon and a female from the Me Song forest, N. Siam. This latter was at first thought to be the female of *melisa*, of which two males were obtained in S. E. Siam, but it agrees so very closely with Hewitson's Type of *cyara* that it seems more probable that it belongs to that species, especially as the two localities, that of *melisa* and that of *cyara*, are some 500 miles apart and separated by the central plain of Siam. The true female of *melisa*, therefore, still remains to be discovered, and the distribution of the two species is: *cyara*, N. E. India to N. Siam; *melisa*, Lower Burma to S. E. Siam.

HESPERIIDÆ.

HESPERIINÆ.

22. Orthophætus barroni, sp. nov.

(Plate VI, figs. 10 and 11.)

Capila zennara, Godfrey (*nec* Moore), Journ. Nat. Hist. Soc. Siam, ii, p. 141 (1916).

♂. *Upperside, both wings.*—Uniformly dark brown, the veins

rather darker, thickly sprinkled from base outwards, more particularly on hindwing, with long rich ochreous scales. *Forewing.*—An irregular oblong translucent white spot across distal end of cell. *Hindwing.*—Immaculate. *Underside both wings.*—Uniformly dull grey-brown with a faint purplish tinge distally in some lights; veins not more heavily marked.

Palpi, head, except laterally where it is pure white, thorax, patagia and abdomen (anteriorly) richly ochreous. The centre of thorax and posterior part of abdomen are unfortunately denuded of scales in the Type specimen. Thorax and abdomen below of same colour as the wings; breast ochreous. Antennae dark brown, paler beneath. Only the hind pair of legs remain on the Type specimen; these have two pairs of spurs and a long pencil of hairs on the tibiae, the latter arising right at the proximal end.

No costal fold, outer margin slightly concave anteriorly.

♀. *Upperside, both wings.*—Uniformly dull dark brown with a decided dull purplish suffusion especially basally; the veins darker. *Forewing.*—The translucent spot at cell-end much larger than in the male, and connected with an oblong spot above it not quite reaching costal margin, and a curved irregular band below it reaching to within 1mm. of extremity of vein 1, the whole forming a broad transverse silvery band right across the wing, most deeply indented at and above origin of vein 4. *Hindwing.*—Traces of darker internervular rays are present in areas 1*c* to 5; abdominal area paler. *Underside, both wings.*—As above. *Forewing.*—The purplish suffusion more pronounced beyond transverse band and the inner margin paler. *Hindwing.*—All trace of darker internervular rays is absent.

Antennae, head and palpi as in the male. Thorax and abdomen throughout dark grey-brown, except for the pale grey extremity of the latter.

Wings much fuller than in male, outer margin of forewing evenly convex.

Length of forewing.—♂, 32 mm; ♀, 34.5 mm.

Length of inner margin (base to extremity of vein 1), ♂, 20.5 mm.; ♀, 23.5 mm.

Length of outer margin (apex to extremity of vein 1), ♂, 22 mm; ♀, 21.5 mm.

B. M. Type No. Rh. 133, ♂, 28.4.14; 134, ♀, 20.4.14, Hup Bon, S. E. Siam.

This species together with *O. phaneus* Hewitson, (wrongly identified by Watson when setting up the genus) and *O. omeia* Leech, form a subsection of the genus *Orthophaetus* Watson, in which the males have no costal fold. The female bears a superficial resemblance to the females of *Casyapa corvus* Felder and *Capila zennara* Moore, and had in fact been previously recorded (*l. c.*) from Siam as the latter. We name the species after Mr. P. A. R. Barron, of the Borneo Company, near whose bungalow in the Sriracha forest it was obtained.

23. **Hasora proxissima** Elwes & Edwards.

(Plate VI, fig. 9.)

A short series of four males and one female of a species of *Hasora* taken at Nong Yai Boo, near Sriracha, S. E. Siam, in April 1914 seem inseparable from the above species described from the Philippines (Mindoro). We rely on the figure and description for this identification as we have not seen an authentic specimen to compare ours with.

Three of the males differ in having a faint pale spot on the underside of forewing in area 2 close against vein 3, a short distance from its origin. In all other respects they all agree exactly with the figure.

The female, which does not seem to have been described so far, differs from the male, apart from the normal sexual differences in the shape of the wings, &c, only in having ochreous more or less translucent marks in areas 2 and 3 of forewing. The lower of these corresponds in position to the pale mark referred to in the male and is crescentic, anteriorly truncate; the upper one is similar in shape, placed considerably beyond the other, the horns of the crescent cut off by the veins (3 and 4). The underside, apart from these markings, which are the same below, exactly resembles the male.

Length of forewing.—♀, 24 mm.

B. M. Type No. Rh. 135, ♀, Nong Yai Boo, S. E. Siam, April 1914.

This species is most readily separable from *H. vitta* Butler, (=*chabrona* Plötz) by the absence of the white subapical spot on the forewing, and the much greater width of the white transverse band of the underside of the hindwing. Butler in his figure and description of *H. vitta* makes no mention of the presence of this minute subapical spot, and consequently Elwes failed to identify the species with *chabrona*, but nevertheless his Type, which is in the British Museum, most obviously possesses it. A form of *vitta*, which may prove to be a distinct subspecies of it, also occurs in Siam but has not been obtained yet in sufficient numbers to enable us to judge whether the slight differences from typical *vitta* exhibited are constant or not.

Explanation of Plate IV.

Fig. 1. *Papilio laos*, sp. nov., ♂.

2. *Mycalesis siamica*, sp. nov., ♂.

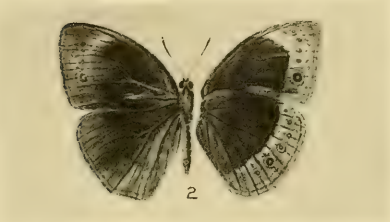
3. „ „ ♀.

4. *Ragadia critias*, sp. nov., ♂.

5. *Stichophthalma cambodia editha*, ssp. nov., ♂.









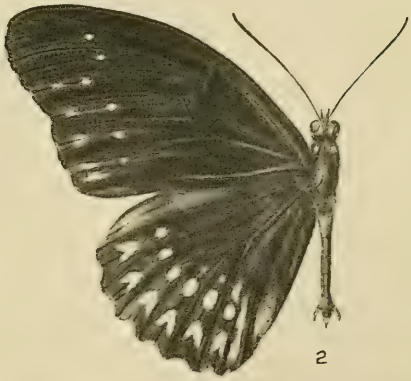


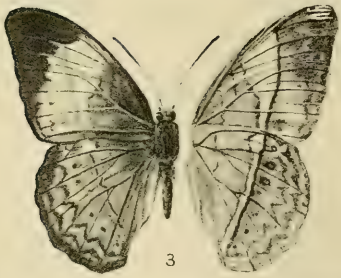
RHOPALOCERA FROM SIAM.

Explanation of Plate V.

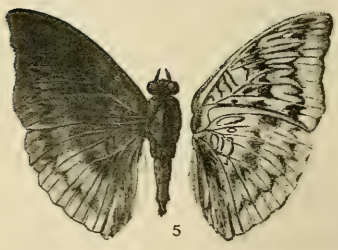
Fig. 1. *Penthema darlisa melema*, ssp. nov., ♂.
2. „ *binghami mimetica*, ssp. nov., ♂.
3. *Cirrochroa chione*, sp. nov., ♂.
4. *Neptis cartica meraca*, ssp. nov., ♂.
5. *Euthalia monina grahami*, ssp. nov., ♂.
6. „ „ „ ♀.
7. *Laxita telesia boulleti* Fruhst., ♂.
8. *Gerydus ancon siamensis* Godfrey, ♂.
9. „ „ „ ♀.



















RHOPALOCERA FROM SIAM.

Explanation of Plate VI.

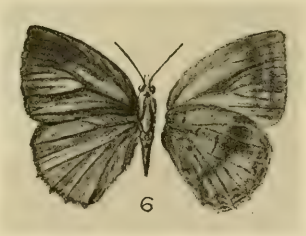
Fig. 1. *Allotinus posidion rekkia*, ssp. nov., ♂.
2. „ „ „ ♀.
3. „ *drumila grisea*, ssp. nov., ♀.
4. *Talicada metana*, sp. nov., ♀.
5. *Azanus urios*, sp. nov., ♂.
6. *Arhopala andamanica ignara*, ssp. nov., ♂.
7. „ *opalina* Moore, ♀.
8. „ *dispar*, sp. nov., ♂.
9. *Hasora proxissima* Elwes & Edwards., ♀.
10. *Orthophaetus barroni*, sp. nov., ♂.
11. „ „ ♀.







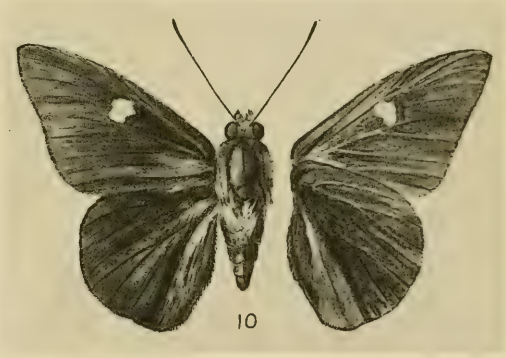




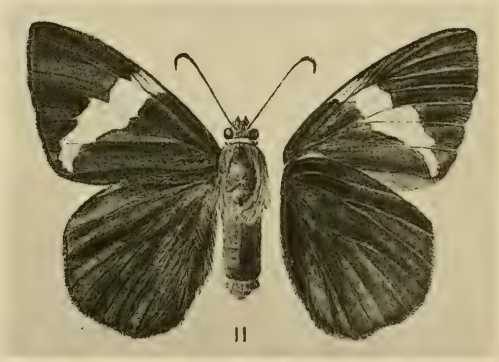












RHOPALOCERA FROM SIAM.

Explanation of Plate VII.

Fig. 1. *Thauria lathyi siamensis* Rothschild, ♂.

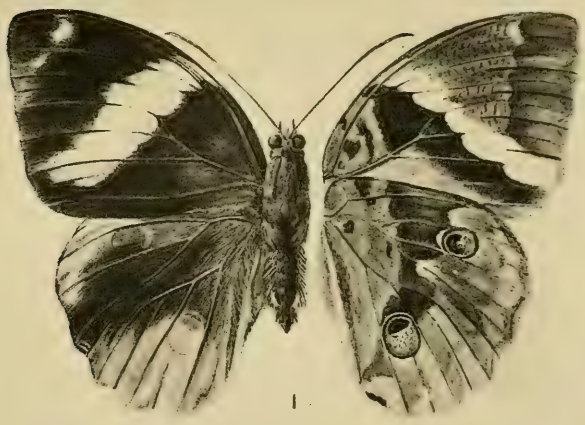
2. *Terinos terpander intermedia* Godfrey, ♂.

3. „ „ „ „ ♀.

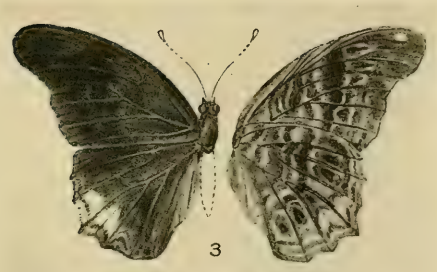
4. *Everes rileyi* Godfrey, ♂.

5. „ „ „ ♀.

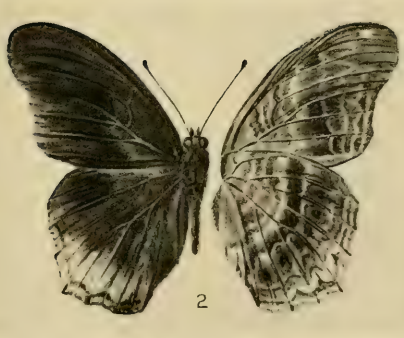
6. *Hestia leuconoe siamensis* Godfrey, ♂.













RHOPALOCERA FROM SIAM.

A NEW RACE OF NUTMEG-PIGEON FROM PULO CONDORE.

By C. Boden Kloss, M.B.O.U., C.F.A.O.U.

During a second visit in December 1920 to Pulo Condore, off Cochin-China, Mr. W. J. F. Williamson's collector obtained two specimens of a Nutmeg-Pigeon which, though remarkably distinct, I propose to describe as a race of *Myristicivora bicolor*. It differs from the typical form in that, where that is cream-white, this is butter-yellow.

I have satisfied myself by questioning the collector, who observed several living birds, that this tone is not produced by grease in the dead skin; but that it is the natural colour of the bird. The skins are, in fact, utterly different in colour from grease-soaked skins of *M. b. bicolor*.

Myristicivora bicolor condorensis, subsp. nov.

Like the typical race in arrangement of colours, but maize-yellow (Ridgway), where that is white or creamy white, except near the extremity of the outer tail-feathers where the yellow tends to become whitish.

Specimens examined. Two males from Pulo Condore, collected on 3 November, 1920, by Mr. W. J. F. Williamson's collector.

Total length 395, 390*; tail 153, 152*; wing 225, 230*; tarsus 32, 31*; bill from gape 33.5, 32* mm.

"Iris dark, bill and feet plumbeous."

*Type.

A NEW NAME FOR THE FROG RANA PULLUS.

By Malcolm. A. Smith, F. Z. S.

Mr. Herbert Robinson, Director of F. M. S. Museums, has pointed out to me that the name *pullus*, under which I recently described a frog in the Journal of the Federated Malay States Museums, is preoccupied by that of Stoliczka. (Journ. Asiatic Soc. Bengal, (2), xxxix (1870), p. 142).

Another name is therefore required, and I take this from Tasan, the type locality, where the species appears to be common.

Rana tasanae, nom. nov.

Rana pullus, Smith, Journ. F. M. S. Museums, x (June 1921), p. 197, pl. 2, fig. 1.

Type locality, Tasan, 25 miles S. W. of Chumpon, Peninsular Siam.

Types in the British Museum of Natural History.

MISCELLANEOUS NOTES.

No. I.—The Burmese House-Crow *(Corvus splendens insolens)* at Petchaburi.

A recent note by Mr. W. J. F. Williamson in this Journal *(antea,* p. 105), mentioned the reported occurrence of the Burmese House-Crow in Ratburi and Petchaburi. This was the testimony of various Siamese, who knew the bird as *I-kae* (อีแก) from its call, which differs from the call of the Jungle-Crow *(Corvus coronoides andamanensis).* Its size is also somewhat less and the neck slightly grayish, but the call is by far the chief distinction. Those who knew it concurred that it was rare and shy.

After several attempts I have just succeeded in getting a specimen at Wat Phra Taht, Petchaburi, but it cost a number of cartridges, and in the end my collector gave up after obtaining this one, saying the birds were all too shy and he could not find others, though I had asked for three, to get both sexes. The last he shot fell in the Wat (Temple) grounds, and undoubtedly was picked up, though all denied it. For it seems that the bird is esteemed as medicine (probably on account of the difficulty of procuring it), and it is not unlikely that some of the very priests who denied seeing it, had told one of their boys to gather it up, too rare and good a chance to lose. It is kept till high, then pickled in spirits, or else split whole and roasted over the fire, and thus makes Ya-mu (ยาหมู), a medicine which is valuable (?) for *Sang* (ซาง), a term which may include almost any unidentified wasting child's disease.

The measurements of the bird (a female, not nesting, possibly a just-adult nestling of this year, as there are a few pin feathers on the neck, and one of the wing primaries on either side is also undeveloped) are as follows:—Total length 14.5 inches, tail 5.5, bill 1.5, spread of wings 24, tarsus 1.5—as against those of the Jungle-Crow *(Corvus c. andamanensis):*—Total length 20 inches, tail 7, bill 2.5, spread 29 and tarsus 2.5. The color is black, except the slightly gray neck.

The place of nesting I have not ascertained, though the bird is said to occur in Petchaburi in varying numbers throughout the year.

Lucius C. Bulkley, M.D.

Petchaburi, 25th August, 1921.

[Dr. Bulkley's measurements indicate a small bird, not full grown. If the breeding season in Siam is the same as in Burma (middle of March to beginning of rains—*vide* Faun. Brit. India, Birds, i, p. 22), an example shot in August might very well be sub-adult.

Dr. Bulkley went on leave, immediately after writing this note, and we understand that he took the specimen with him, for presentation to one of the American Museums.

It may be added that Mr. Williamson sent his collector to Petchaburi in October (two months after Dr. Bulkley obtained his bird), with express instructions to proceed to Wat Phra Taht, or elsewhere in the town, for the purpose of procuring specimens of this crow, but the man reports there were none to be seen.—Eds.].

No. II —The Giant Ibis *(Thaumatibis gigantea)* in Cambodia.

In December 1918 Dr. Malcolm Smith and I sent a couple of collectors to Koh Kong (Koh = island), and the adjacent Cambodian coast in about Lat 11° N., slightly below the point where the extreme south-east of Siam joins French Indo-Chinese territory.

The birds obtained on that trip have not yet been critically examined, but the fact should be recorded that, among them, is a pair of the still rare Ibis, *T. gigantea*, of which six specimens now appear to be known.

Oustalet's type came from Cochin-China [*Ibis gigantea*, Oust., Bull. Soc. Philom. (7) I, (1877), p. 25], while the next two examples were obtained in Trang, Peninsular Siam, by Dr. W. L. Abbott, and Messrs. Robinson and Kloss, respectively (Ibis, 1911, p. 17), and the fourth by Mr. K. G. Gairdner in the Circle of Ratburi, on the western side of central Siam [Journ. Nat. Hist. Soc. Siam. II (1916), p. 71]. The two now recorded are practically topo-types of Oustalet's bird, and are the first which have been secured otherwise than as isolated examples.

The collector who shot them reported, on his return, that he had seen at least one other specimen, so it is to be hoped that, at all events in some part of its habitat, the bird is not quite so rare as it has hitherto been believed to be.

♂, ♀. Kampong Sum Bon, near Sré Umbel, coast of Cambodia, 24 December, 1918.

Colours of soft parts (Native collector). Iris red, legs red.

Measurements. Total length (Native collector), ♂ 1065, ♀ 1020 mm. Other measurements (dried skin). Bill from gape, ♂ 223, ♀ 198. Wing, ♂ 554, ♀ 525. Tarsus, ♂ 113, ♀ 105 mm.

W. J. F. Williamson.

Bangkok, October, 1921.

No. III.—Earth Snake eating a Grass Snake.

An instance of the common Grass Snake *(Natrix piscator)* falling a victim to the apparently quiet and inoffensive Earth Snake *(Cylindrophis rufus)*, came recently under my notice while out after snipe.

The Grass Snake first attracted my attention as it lay on the side of a bund in the padi field, apparently lifeless. On going to pick it up, however, I found that it was not dead, but that it was firmly caught by the neck by something, and partly pulled into a hole in the bank, so that its head was doubled back on its body. So tightly was it held that it required considerable force to extract it, and in doing so revealed the head and neck of an Earth Snake, with its jaws firmly closed on the Grass Snake's neck. On trying to pull the Earth Snake out further, it relinquished its hold and retreated deeply into the bank, from where I was unable to recover it. From the view I obtained I gathered it to be about the same size as its victim. Presumably it was in residence in the hole in the bank, and the Grass Snake, entering in search of food, had been suddenly surprised and seized in the manner described. In no other way can I account for such a snake as *Natrix piscator*, well known for its active habits and aggressive nature, being overcome by another snake no larger than itself. In due course the Earth Snake would have worked its jaws along to its victim's head and then swallowed it.

Of the voracious habits of *Cylindrophis rufus* I have seen many instances. This snake feeds, as far as I know, upon eels and other snakes, and several specimens that have been sent me have disgorged meals, nearly as thick as, and several inches longer than, themselves.

Both snakes are common in Bangkok and throughout Siam in the lowland country. *C. rufus* is a nocturnal species, and in Bangkok, may be often seen lying in the road where it has been killed. It is easily recognised by its thick, purplish-brown body, with incomplete whitish bands. The tail is very short and pink underneath. It does not bite when captured, but has a curious habit of arching its tail over its back in the manner of a scorpion, showing the pink under surface, and looking most aggressive. The tail is blunt and of about the same thickness as the head, and to the Siamese this creature is often known as the two-headed snake. It is reputed to be very dangerous. *N. piscator* is the common Grass Snake of the padi fields. When caught it bites fiercely, but with its small teeth can not do much damage.

MALCOLM SMITH.

Bangkok, Oct. 20th 1921.

No. IV.—Curious Fishing Ceremony on the Upper Mekong.

Recently while on tour in the north of Siam, I came across an interesting ceremony amoung the Lao people at Wieng Kuk, near Vien Chan on the Upper Mekong.

From the 13th increase of the moon to the 15th in February

every year, people come from far and near to witness the catching of a huge (?) fish locally designated Pla Bük (ปลาบึก). Interference with the creature at any other time of the year, is said to bring terrible misfortune upon the offender.

The fish are stated to frequent the whole length of the Mekong river up to this point, as well as being found at the mouth. They are about 12 ft. in length, and 8 to 10 ft. in girth, have smooth black skins and are scaleless. Their heads are blunt and toothless. The females have a pair of mammae. When caught their stomachs are never found to contain anything but stones.

The fish are seen rising and ascending the river, when their capture is attempted. Only particular, and specially skilled people, are allowed to indulge in this business. Boats proceed up stream with huge seine nets, and drop them so that they extend to a great depth, across a narrow defile of the river above where the fish have been seen. These as they ascend charge into the nets and are caught by their gills. It is said that they make no attempt to turn and go down stream. The fishermen come up and guide them ashore, where they are tethered in the water by their gills until sold. Great care and skill has to be exercised in catching the fish when enmeshed, as the overturning of a boat is apt to lead to fatal results, owing to the strong undercurrent.

A curious part of the ceremony is that, on peril of the greatest misfortune, those engaged must keep up a continual flow of abuse.

The fish is said to be very powerful, and it is alleged that purchasers living upstream utilise them to tow their boats home. The live fish sells for Tcs. 200—240. The Lao chief of Vien Chan collects a fee of Tcs. 10 per fish caught, for charges incurred in propitiating the guardian spirit of the river. The retail price is Tic. 1 per catty. The flesh is much prized, and is eagerly consumed by the Laos, who believe it brings good luck and success in trading.

As I have not myself seen the creature, I should be glad of any further information readers of this Journal may have, or any suggestion as to the nature of this so-called fish.

A. H. Duke.

October, 1920.

7th Annual General Meeting.

This was held on the 25th of February 1920, and was attended by 18 members and 2 guests.

The report and accounts for 1919, showing a membership of 59, and a balance in hand of Tcs. 301, were accepted and passed.

The election of officers for the year 1920 resulted as follows:—President, Mr. W. J. F. Williamson; Vice President, Dr. Malcolm Smith; Hon. Secretary and Treasurer, Mr. C. L. Groundwater; and a committee consisting of the above three members and Messrs. S. G. Lambert, L. Brewitt-Taylor, and C. E. W. Hogge. Owing to the pending absence of Dr. Smith on leave, Mr. Williamson agreed to carry on the work of editing the journal with Mr. Brewitt-Taylor as co-editor.

The President informed the members that a sum of $1,500 or Tcs. 1,951.22 had been received from the F. M. S. Museums, as their contribution to the cost of publication of a series of papers on the Vertebrates of Peninsular Siam in the Society's Journal.

The business part of the meeting having been concluded, Mr. Williamson exhibited a series of the Woodpeckers and Barbets of Siam. Mr. Herbert exhibited some of the mammals collected by him in the past and described in a previous number of the Society's Journal by Mr. Boden Kloss. (Vol. II., No. 1). He also showed specimens of the wings and tails of the Fantail and Pintail snipe, showing the changes due to moult which take place when the birds arrive in this country. Dr. Smith exhibited some interesting snakes and lizards.

2nd Ordinary General Meeting, 1920.

The 18th Ordinary General Meeting was held on December 10th, 1920, at the offices of the Bangkok Times. Mr. Williamson was in the chair. There were present 7 members and 11 guests.

The minutes of the last ordinary general meeting were read and confirmed. Mr. Williamson then exhibited a collection of zoological specimens obtained at Pulo Condore during the previous month, by collectors sent there jointly by Mr. C. Boden Kloss and himself. This expedition he stated was the second in which he had had a part, the previous one having been sent there by Dr. Malcolm Smith and himself in the autumn of 1919. The results of the first were being described in the Journal then in course of issue, and they had been of sufficient interest to justify a second and longer expedition.

After briefly describing the geographical position of the group to which the larger island gives its name, and mentioning the famous travellers of the 17th, 18th, and early 19th centuries who had visited the island, Mr. Williamson proceeded to deal with the specimens exhibited at the meeting. These included examples of

125 mammals collected, comprising 9 species, and 160 specimens of birds, comprising 42 species. The total number of species of birds obtained in 1919 and 1920 was 47.

The reptilian and batrachian collection obtained was not large, but comprised two new species of Ground Gecko. These were being described by Dr. Malcolm Smith in the coming number of the Journal.

Of butterflies, 226 specimens were obtained, comprising 34 species, and 13 dragon-flies, comprising 6 species.

It thus appeared that the expedition had been quite a successful one.

8th Annual General Meeting.

This was held at the Bangkok Times office on 23rd February 1921, and was attended by 16 members and 8 guests. The minutes of the previous annual general meeting were read and confirmed.

The report showed an increase of members during the year from 59 to 63, which included the addition to the honorary members of Major J. C. Moulton, who had recently been appointed to the post of Director of the Raffles Museum, Singapore. Major Moulton had previously held the position of Curator of the Sarawak Museum, and was well known for his contributions on entomological subjects.

The accounts, showing a balance in hand of Tcs. 523.40, were passed. Mr. W. J. F. Williamson was re-elected President, Dr. Malcolm Smith, Vice President, and Mr. S. H. Cole, Hon. Secretary and Treasurer. Messrs. E. J. Godfrey, S. G. Lambert and C. E. W. Hogge were elected on the committee. Messrs. Smith and Williamson were elected Editors of the Journal.

In reporting on the work of the Society during the past year, the Chairman stated that it had suffered considerably owing to the absence of Dr. Smith and Mr. Godfrey on leave, the departure of Mr. Herbert permanently from Siam, and his own absence from Bangkok during three months.

He then referred to the expedition to the Upper Mekong under Police-Major Day which left *via* Utaradit in December 1919. This was financed by Doctor Smith, Mr. Herbert, Messrs. Robinson and Kloss, Major Fraser, Mr. Godfrey, Mr. Cable and himself, with the object of collecting zoological specimens along the valley of the Mekong between Pak Lai and Ubon, returning to Bangkok *via* Korat. The trip occupied some 4 months, but owing to the hurried manner in which it was carried out had proved far from successful.

An exhibition of specimens then took place. Mr. Th. H. Lyle exhibited the skin and skull of a Binturong shot in Chiengmai; Mr. Williamson exhibited the birds obtained by his collector on the Mekong valley trip; Mrs. Gittins and Mr. Godfrey exhibited some butterflies collected in Bangkok.

STATEMENT OF ACCOUNTS FOR 1920.

RECEIPTS.		Tcs.	Cts	EXPENDITURE		Tcs.	Cts	
	Ticals				Ticals			
Balance from 1919 ...		301	92	Production of Journal:—				
Subscriptions received for 1919	100.00			On a/c of Vol. III No. 5	286.00			
1920	995.07			,, ,, ,, ,, IV No. 1	365.44			
1921	20.00	1,115	07	,, ,, ,, ,, No. 2	230.56	882	00	
Sale of Journal:—				Postage, etc.				
Hon. Sec.	4.65			Hon. Sec.	1.70			
Witherby & Co's. a/c	31.25			Do.	17.45	19.15		
	17.40	48.65		Bangkok Times	76.23	95	38	
Bangkok Times	34.00	87	30	Printing & Binding ...		61	50	
Thacker Spink & Co. (Deposit of Tcs. 25 returned) ...		28	55*	Hire of Room for General Meetings ...		10	00	
Interest on Current Account	5.13			Balance at Bank	639.51			
Interest on Fixed Deposit	34.31	39	44	Less Cheques not presented:—				
				Postage	17.45			
				Bangkok Times	147.73	165.18	474	33†
				Cash in Hand	15.07			
				Do. from Bangkok Times sales of Journal	34.00	49	07	
	Ticals	1,572	28		Ticals	1,572	28	

C. L. GROUNDWATER,

Hon. Secretary and Treasurer.

*Difference due to Exchange.

† In addition there is a sum of Tcs. 1,960.97 on Fixed Deposit for Special Publication account.

LIST OF MEMBERS ON 31ST OCTOBER, 1921.

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Barron, P. A. R.
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Spencer, F. D.
Spigno, A. B.
Trotter, E. W.
Weston, C. M.
Williamson, W. J. F., C.M.G., F.Z.S., M.B.O.U.
Winit Wanadorn, Luang.

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H. R. H. The Prince of Chumpon.

Baker, E. C. Stuart, F.Z.S., M.B.O.U.

Gyldenstolpe, Count Nils, B. A.

Robinson, H. C., C.M.Z.S., M.B.O.U.

Kloss, C. Boden, F.R.G.S., F.Z.S., M.B.O.U.

Moulton, Major J. C., M.A., B.SC.

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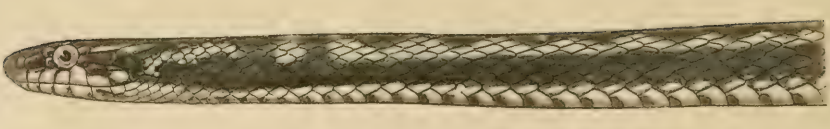
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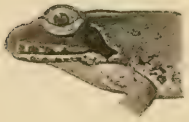
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1.



J. Green, del.

1. RANA AENEA. 2. NATRIX GROUNDWATERI.

THE

JOURNAL

OF THE

Natural History Society of Siam.

Volume IV. Bangkok. Number 4.

NOTES ON REPTILES AND BATRACHIANS FROM SIAM AND INDO-CHINA, (No. 1).

By Malcolm A. Smith, F. Z. S.

With plate 8.

Testudo impressa = *Testudo latinuchalis.*
Natrix nigrocinctus = *Tropidonotus eisenhoferi.*
Natrix groundwateri, sp. nov.
Holarchus longicauda = *Simotes longicauda joynsoni.*
Lygosoma vittigerum kronfanum, ssp. nov.
Rana aenea, sp nov.
Rana nigrovittata = *Rana mortenseni.*
Microhyla butleri = *Microhyla latastii.*

The present article contains descriptions of three new forms:— (1) A new snake *(Natrix groundwateri)* from the extreme south of Siam, obtained by the Robinson and Kloss expedition to that part of the country in 1919, (2) a new race of the small but handsome scink, *Lygosoma vittigerum*, obtained by myself on the Langbian plateau, S. Annam, in 1918, and (3) a new frog, *Rana aenea*, found by my native collector when accompanying Messrs. Carthew and Godfrey on a trip to the extreme north of Siam early in 1921.

Judging by the results of expeditions which have been undertaken in Siam during the last few years, it would seem as if the herpetological survey of the country was nearing completion. New forms will still no doubt be found upon the higher hills, particularly in the Nakon Sritamarat range and along the Burma frontier, where many peaks still remain unexplored. The genus *Philautus*, in particular, should repay investigation. The small frogs included under this group confine themselves almost entirely to mountain streams, and in Siam, are seldom found below the 700 metre level. Their diminutive size, protective colouration and nocturnal habits, make them extremely difficult to find, and unless a definite search is made for them they are seldom seen. They are best found by hunting for

them at night with a lamp, when their shrill cries reveal their presence among the foliage in which they live, and they can be easily tracked down and caught.

I have also included in the paper certain changes in nomenclature which I believe to be correct. These conclusions have been reached only after the study of a considerable amount of material, in most cases of living specimens as well as of preserved ones.

Testudo impressa Günther.

Geoemyda impressa, Günther, P. Z. S. 1882, p. 343, figs. 1–3.
Testudo emys, Boulenger, Ann. Mus. Civ. Genova, 1893, (2) xiii, p. 312.
Geoemyda latinuchalis, Vaillant, Bull. Soc. Philom. Paris, 1894; (8) vi., p. 68; id., Mocquard, Rev. Colon., Rept. Indo-chine, 1907, p. 10.
Testudo pseudemys, Bouleng., Fascic. Malay., Zool., 1903, i. p. 144. pl. ix, and text fig. 1. (skull); Annandale, Journ. Proc. Asiat. Soc. Bengal, 1906, (2) ii. p. 204.
Testudo latinuchalis, Siebenr. Zool. Jahrb., Suppl. 1909, x, p. 520; Bouleng., Fauna Malay Penin., Rept. 1912, p. 15.

Testudo impressa was described by Günther from a single shell received from Siam. It was subsequently referred by Boulenger to *Testudo emys* Schleg. & Mull., and of late appears to have been forgotten.

While working with Mr. Boulenger in the British Museum prior to his retirement, we took the opportunity of examining this shell, and of comparing it with a series of tortoises that I had collected in Siam. There was no doubt whatever that it was not *T. emys* at all, but was identical with the species now recognized as *Testudo latinuchalis* (Vaillant).

Boulenger's separation of *T. emys* from *T. latinuchalis* (Faun. Malay Penin., p. 14) on the relative proportions of the vertebral shields is not a sufficient one, owing to the variations in size which are found in different individuals. In several other characters, however, the two are so distinct that there can be no doubt as to their specific identities.

Confirmation is also to be found in the cranial characters, the skull of one of my specimens of *T. latinuchalis* differing from

that of *T. emys*, but agreeing well with that of *T. pseudemys*, a species now recognised as *T. latinuchalis*.*

Testudo impressa Günther must therefore be revived, and *T. latinuchalis* placed under it. Apart from the skull, this species can be distinguished from *T. emys* by the following characters :—

T. impressa.	*T. emys.*
Pectoral shields always in contact.	Pectoral shields usually widely separated.
Margins of the carapace usually strongly reverted and serrated in the adult.	Margins of the carapace not usually strongly reverted or serrated in the adult.
Shell yellowish or pale brown, rich dark brown or black at the margins of the shields.†	Shell dark horn to blackish.
Maximum length of shell in a straight line 270 mm.	Maximum length 520 mm.

Natrix groundwateri, sp. nov.

PLATE 8, fig. 2.

Type ♂, Author's No. 3354, collected by Messrs. Robinson and Kloss at Tasan, 40 kilometres S. W. of Chumpon, Peninsular Siam, in March, 1919.

Description of the type. Maxillary teeth 30,‡ the last not abruptly enlarged; rostral much broader than deep; internasals narrowed anteriorly, as long as the prae-frontals; frontal once and a quarter as long as broad, as long as its distance from the end of the snout, much shorter than the parietals; loreal twice as long as high; two prae- and two or three post-oculars; temporals 1 + 2; 9 supralabials, 4th to 6th touching the eye; 5 infralabials in contact with the anterior chin-shields, which are as long as the posterior.

Scales in 19 rows anteriorly, reducing to 17 at mid-body, and so continued to the vent, smooth anteriorly, feebly keeled posteriorly. Ventrals 147; anal 1; subcaudals 120.

*. For a comparison of *T. emys*, *T. pseudemys* and *T. impressa*, see Boulenger in Fasciculi Malayenses, (1) Zool., p. 145 et seq.

†. A specimen from Dalat, S. Annam has handsome dark brown rays upon the plastron.

‡ It is unfortunate that only the type specimen is sufficiently adult to allow of a satisfactory examination of the teeth, and in this specimen also they are obscured by damage. It appears, however, to belong to *Natrix*.

Total length 450 mm; tail 165.

Black above with a dorso-lateral chain of yellow spots; outer two rows of scales with yellow centres; labials yellow with black sutures, and a yellow streak from the angle of the mouth on to the nape. Below yellowish, with a black spot at the outer edge of each ventral and subcaudal shield.

Variation. Four others (juveniles) taken in the same locality show no variation from the type specimen, except in the number of the ventral and caudal scutes, and in the colour of the head, which is light brown above with yellow vermiculations.

Natrix groundwateri is named after Mr. C. L. Groundwater, to whom I have been indebted on many occasions for illustrations which have appeared in this Journal. It is allied to *N. inas* (Laidlaw) from the hills of Perak and Peninsular Siam.

Measurements in mm.

Author's No.	Total length.	Tail.	Ventrals.	Caudals.
3354 (type)	450	165	147	120
3355	245	85	154	120
3356	185	75	154	126 ?
3357	180	70	151	?
4437	230	85	151	?

Type presented to the British Museum. Paratypes in my own collection.

The illustration is twice the natural size.

Natrix nigrocinctus (Blyth).

Tropidonotus nigrocinctus, Blyth, Journ. Asiat. Soc. Bengal, 1856, xxiv., p. 717; Bouleng., Cat. Sn. B. M., 1893, i, p 255; Smith, Journ. Nat. Hist. Soc. Siam, 1915, i, p. 244; id., ibid., 1916, ii. p. 159.

Tropidonotus eisenhoferi, Gyldenstolpe, K. Sv. Vet. Akad. Hand., 1916, Band 55, No. 3. p. 11, text fig.

A series of 19 examples of this snake from Siam shews it to be a very variable species. The collection includes examples from three well separated localities—from northern Siam nearest to the type locality (Pegu), from Peninsular Siam and from S. E. Siam.

Each region appears to have its own variation, which, with the material now available, may be chronicled as follows:—

NORTHERN SIAM.

1 praeocular; ventrals 161–168; subcaudals 85–96.

Adult with distinct black cross bands; posterior 2/3 of belly and tail thickly powdered with grey, or tail below entirely dark grey. (10 specimens).

Details of specimens of *N. nigrocinctus*.

No.	Sex.	Ttl.	Tail	Scales	Vent.	Caud.	Locality.
3091	♀	740	205	19.17	166	93	Me Wang, N. Siam.
3094	♀	875	155 ?	,, ,,	166	44 ?	,, ,,
3092	♀			,, ,,	161	24 ?	,, ,,
3095		400	105	,, ,,	163	90	,, ,,
3093	♀	880	250	,, ,,	165	96	,, ,,
3090	♂	800	220	,, ,,	161	85	,, ,,
1686	♂	495	135	,, ,,	165	92	,, ,,
3101	♂	370	100	,, ,,	164	96	,, ,,
2912	♀	yg.		,, ,,	168	92	Me Nga, ,,
3096	♂	,,		,, ,,	165	96	,, ,,
T. eisenhoferi.		950	228	,, ,,	160	73	M. Fang, ,,
*7481	♀			,, ,,	167	86	Pegu (Burma).
4105	♀	Hf. gr.		,, ,,	157	78	Tasan, P. Siam.
4104		Yg.		,, ,,	152	82	,, ,,
3238	♀	590	155	,, ,,	153	77	Tapli, ,,
1684	♀	Yg.		,, ,,	150	72	Chumpon. ,,
1685	♀	,,		,, ,,	153	79	Klong Bang Lai, ,,
1883	♀	Hf. Gr.		,, ,,	164	74	Hup Bon, S. E. Siam.
1682	♀	635	120	,, ,,	160	53 ?	Klong Yai, ,,
1681	♂	825	210	,, ,,	156	84	,, ,,
1713	♀	840	185	,, ,,	159	65 ?	Khao Sabab, ,,

* Indian Museum number. One of the types which I have compared with my series.

PENINSULAR SIAM.

1 praeocular; ventrals 150–157; subcaudals 72–82.

Colour as above. (5 specimens).

S. E. SIAM.

2 praeoculars; ventrals 156–164; subcaudals 74–84.

Adult with cross bands hardly distinct or absent. Posterior 1/3 of belly and tail sparingly powdered grey. (4 specimens).

Other variations. The postoculars may be 3 or 4 in number; the temporals are usually 2 + 2, but in one example (No. 3090) are 1 + 2; 9 supralabials is the rule, but in two examples there are 8 on one side; the outer row of scales is variable as regards the strength of the keeling, which may be entirely absent.

I have no hesitation in placing under this species Gyldenstolpe's *Tropidonotus eisenhoferi* from N. Siam. Its separation from *Natrix nigrocinctus* upon 4 postocular shields and an outermost row of smooth body scales, is untenable with the series now shewn.

Holarchus longicauda (Boulenger).

Simotes longicauda, Bouleng., Ann. & Mag. Nat. Hist., 1903, (7) xii, p. 350.

Simotes longicauda joynsoni, Smith, Journ. Nat. Hist. Soc. Siam, 1917, ii, p. 276.

Last year when home on leave I was able to compare my *S. l. joynsoni* with Boulenger's type of *longicauda* in the British Museum. The difference in colouration between them was far less than I had gathered from the description, so much so that mine can no longer be recognised as a form apart.

Since Mr. Joynson obtained his specimens, I have examined four more from Siam, two from the Me Wang forest and two from Pak Jong in the Dong Rek mountains. They show well the great variability of the species with regard to colouration and markings.

Lygosoma vittigerum kronfanum,* subsp. nov.

Type, Author's No. 2417, collected at Daban, Langbian plateau, S. Annam, in March 1918.

* Named after the Kronfa river on the banks of which the specimens were obtained.

Total length 93 mm., head and body 34. Differs from the typical form described by Boulenger (Ann. Mus. Civ. Genova, 1895, (2) xiv. p. 615) in the greater average number of scales round the body, 28-32, in the average shorter legs, the hind limb reaching only to the digits or the elbow of the adpressed fore-limb, in the praefrontal shields forming a broad suture, and in having 5 well-defined light stripes, instead of a single vertebral one.

Six specimens examined, all from the type locality, shew the very distinctive colouration of this new race, which is as follows:—

Black above, with 5 greenish-white dorsal stripes, namely, a vertebral one from the tip of the nose to the root of the tail, a dorso-lateral pair from the upper eyelid to above the thigh, and a lateral pair from the upper lip to the groin, the black edging to the latter being less clearly defined than in the others. Throat and belly greenish-white; tail light brownish with black dots along the sides.

I have not compared my specimens with any of the typical form from the Malay Archipelago, but have done so with a good series from Siam and the Malay Peninsula.

Indications of this multiplication of the dorsal stripe are shown in some of my Siamese examples from as far south as Hat Sanuk (Koh Lak, Lat. 12° N.), the dorso-lateral pair being present, but with the dark edging outside indistinct, and that only in the anterior part of the body.

One juvenile from the north of Siam (No. 3169) has 3 well marked light stripes throughout the whole length of the body; and further collections from this region may establish a race with 3 light stripes only.

Another juvenile from Chet Ton (N. Siam), on the border of French Laos, is intermediate between this form and the one from Annam.

Details of *L. vittigerum kronfanum*.

	Type.					
No.	2417	2418	2453	2454	2455	2456
Scales round body ..	30	32	30	28	28	30
Leg reaches the ..	elbow	hand	wrist	hand	hand	elbow
Locality	Daban	Daban	Daban	Daban	Daban	Daban

	Other Specimens.								
No.	5909	3361	4514	2370	2371	2373	2372	3169	5529
Scales	30	28	28	28	30	28	32	30	30
Leg reaches the ..	elbow	elbow	..	axil	axil	elbow	axil	elbow	elbow
Locality	Gunong Tahan, F.M.S.	Tasan P. Siam.	Hat Sanuk P. Siam.	Sai Yok S. W. Siam.	Sai Yok. S. W. Siam.	Chantabun S. E. Siam.	Prae N. Siam.	Me Wang N. Siam.	Chet Ton. N. Siam.

In addition to the specimens here enumerated, two others only appear to be recorded from the Asiatic mainland, one from Ginting Bidai, and a second from Gunong Tahan in the Malay Peninsula. In all the specimens (example from Ginting Bidai not examined) the praefrontals form a broad suture.

The mainland form therefore appears to differ from the typical (archipelagic) one in the following particulars:—longer proportion of body, the distance from the snout to the fore-limb being once and one-sixth to once and one-third in distance from axil to groin, shorter limbs, praefrontals always in suture, and greater average number of scales round the body.

Rana aenea, sp. nov.

Plate 8, fig. 1.

Type ♀, collected on Doi Chang, N. Siam. at about 1500 metres altitude, in May 1920; Author's No. 5821.

Description of the type. Vomerine teeth in small, slightly oblique series, commencing from the level of the posterior borders of the choanae, equidistant from them and from each other. No bony prominences to the lower jaw. Head broader than long; snout rounded, slightly projecting beyond the mouth, as long as the orbit; canthus rostralis distinct, loreal region oblique, slightly concave; nostril equidistant from the eye and the tip of the snout; distance between the nostrils twice the interorbital width, which is less than that of the upper eyelid. Tympanum indistinct, less than half the diameter of the eye, $1\frac{1}{2}$ times its distance from the latter.

Fingers moderate, the tips simply swollen, 1st as long as 2nd, 3rd shorter than the snout; subarticular tubercles moderate. Hind limb long, the tibio-tarsal articulation reaching well beyond the snout; heels strongly overlapping when the limbs are folded at right angles to the body. Toes moderate, the tips dilated into small but very distinct discs, 2/3 webbed, nearly 3 phalanges of the fourth toe free; no groove on the discs separating the upper from the lower surfaces; no tarsal fold; subarticular tubercles moderate, inner metatarsal tubercle moderate, 3/5 the length of the inner toe; no outer tubercle.

Skin quite smooth; posterior half of upper eyelid warty; a glandular fold from the eye to the shoulder; a fine glandular dorso-lateral fold beginning behind the upper eyelid, converging towards its fellow on the shoulders and extending to the hip.

Brownish or greyish-black above, the sides with small rounded, jet-black spots; dorso-lateral fold indicated by a thin whitish line, edged outside with black on the forepart of the body; supratemporal fold with similar markings, the black band including the tympanum; lips black with white spots, limbs with black crossbars. Below yellowish white, the throat finely speckled with black, the belly and limbs with larger black spots.

Nasal bones large and widely separated.

A second female (No. 5822) collected in the same locality differs in that the vomerine teeth are slightly more prominent, the

tympanum more distinct, and the dorso-lateral fold present only half way down the back.

Rana aenea is nearest to *R. palavanensis* Boulenger, from the Malay Archipelago. It differs from it in the smaller and less distinct tympanum, in the smaller digital discs and shorter 1st finger, in the convergence of the dorso-lateral folds and in colouration.*

Type presented to the British Museum; paratype in my own collection.

Measurements in mm.

	Type.	Paratype.
Snout to vent	35	38
Length of head	12.5	14
Width of head	14.5	15.5
Snout	6	6.5
Eye	5	5
Interorbital width	2.5	3
Tympanum	2	2
Fore limb	20	22
Hind limb	65	74
Tibia	22	25
Foot	20	22

Rana nigrovittata (Blyth).

Rana nigrovittata, Bouleng., Rec. Ind. Mus., 1920, xx, p. 144; Smith, P. Z. S. 1921, p. 433.
Rana mortenseni, Bouleng., Rec. Ind. Mus., 1920, xx, p. 135.

In P. Z. S. 1921, I endeavoured to show that *R. nigrovittata* (Blyth) and *R. mortenseni* Boulenger were very closely related to each other. The chief point of distinction between them was, that while the male of the former had external vocal vesicles, that of the latter had internal. In many of my specimens of *nigrovittata* I had found a blackened patch of skin on either side of the throat at

*Compared with two specimens from N. Borneo.

the angle of the jaw, with fine longitudinal folds and an alteration in the character of the skin at that point. This did not appear in *R. mortenseni*.

Since then I have examined a further large series (over 50 examples) of *nigrovittata* from various parts of Siam. The collection moreover includes many full grown males, considerably larger than any previously available for examination, and quite as large as the *R. mortenseni* from Koh Chang.

In all the specimens of *nigrovittata* from Peninsular Siam (largest not over 55 mm. from snout to vent), and in most of those of equal size from N. and N. E. Siam, this condition of external vocal vesicles is evident, but in the larger specimens (65 – 70 mm.) the pigmentation has disappeared, and the skin has resumed its normal colour. The folds, however, still remain; they are more strongly marked in some than in others.

I have never seen any immature males of *R. mortenseni*; and in the few adults I have examined the skin of the throat appears unchanged.

Tadpoles obtained on Koh Chang, where *mortenseni* appears to be the only frog of this group in existence, do not differ from tadpoles of *R. nigrovittata* which I have obtained in other parts of Siam.

The other points of distinction between the two species which I had relied on, namely, the slight difference in the finger tips and the longer leg, disappear with the larger amount of material examined.

It would seem correct therefore, to unite *mortenseni* with *nigrovittata*, and, as regards the question of vocal sacs to describe the species as having internal or feebly developed external ones.

Although my series from different parts of the country intergrade completely with each other it is possible to correlate certain broad variations with geographical areas.

(1) From Peninsular Siam. Presuming my specimens to be fully grown, this is the smallest form. Its length from snout to vent does not exceed 55 mm. The vocal vesicles are feebly developed

externally. In colouration the frogs from this region are of a richer brown than those found further north, and there is often a clearly defined broad dark band along the side of the body. Below whitish. (30 specimens examined).

(2) From N. E. Siam and French Laos. A larger form, up to 70 mm. in length. Colouration greyer, and with the lateral band always broken up. Below often dappled or heavily powdered with grey. Vocal sacs feebly developed externally. (55 specimens examined).

(3) Koh Chang (*R. mortenseni*). A large form, 70 mm. in length. Males with internal vocal sacs. (7 specimens examined).

The types of *Rana nigrovittata* are in the Indian Museum, Calcutta. Type locality Pegu.

Microhyla butleri Boulenger.

Microhyla butleri, Bouleng., Faun. Malay Penin., Rept., 1912, p. 261.

Microhyla latastii, Bouleng., Ann. & Mag. Nat. Hist., July 1920, (2) vi, p. 106.

I have examined the types and only known specimens of *M. latastii* in the British Museum, but cannot distinguish them from examples of *M. butleri*.

This latter frog is widely distributed throughout Siam and Indo-China and I have examined numbers of specimens, both alive and dead. Its colouration is variable, but the dark, white-edged, 3-tiered mark on the back is usually more or less distinguishable.



1.



2.



3.



4.



5a.



5.

5b.

J. Green, del.

RANA DORIÆ AND ITS ALLIES.

Explanation of Plate 9.

1. *Rana doriæ* Boulenger.
2. *Rana macrognathus macrognathus* Boulenger.
3. *Rana macrognathus dabana*, subsp. nov.
4. *Rana pileata* Boulenger.
5. *Rana kohchangæ*, sp. nov.

All the figures are of natural size and drawn from adult males.

THE FROGS ALLIED TO RANA DORIÆ.

By Malcolm A. Smith, F.Z.S.

With plate 9.

The frogs clustered round *Rana doriæ* Boulenger, form a small and compact group, easily separated from all other species affiliated to them, but not so readily distinguished among themselves. The reason for this difficulty lies in the fact that it is only by means of the unusual development which occurs in the heads of the adult males that separation is possible. In bodily configuration, in the position of the vomerine teeth, in the character of the skin, the extent of webbing to the toes, and in colouration, they closely resemble each other, so nearly, that where females or juveniles are concerned, it is practically impossible to distinguish between them. Clearly they are all derived from a common ancestor, and they might still, perhaps, be regarded as racial forms of one species. The male characters, however, are now so distinct and constant, and the range of each form appears to be so well defined,* without intermediate ones occurring that, with one exception, it seems advisable to accord them specific rank. In several localities, moreover, two forms are to be found together. Further information concerning the phylogenetic relationships of this group, may be forthcoming when all its tadpoles are known. I have so far been able to obtain only two of them. In all essential characters these two do not differ from each other.

The range of these frogs is throughout Siam and the regions immediately bordering thereon. They are hill dwellers, inhabiting the mountain streams at all levels up to 1000 metres; and where found they are usually abundant. Excepting *R. doriæ*, I have had the opportunity of seeing them all in their native haunts.

With the large amount of material now in my possession it is possible to review this group in considerable detail. I recognize five forms. Three of these, *R. doriæ*, *R. macrognathus* and *R. pileata* are already known. Two more are now added, *R. kohchangæ* and a new race of *R. macrognathus*.

*Except in the N. and N. E. where extensive collections have not yet been made.

Rana doriæ was the first to be described. It is the simplest of the group, in that the head of the male undergoes no special changes. In the other members the male head, as it arrives at maturity becomes markedly enlarged. This increase in size is particularly noticeable on the lower surfaces of the mandibles, in the enlargement of the masseteric and depressor muscles, in the greater size of the tympanum, and in the increased width of the interorbital region. A bony tooth-like process also develops in the lower jaw on either side of the symphysis.

In addition to these changes *R. macrognathus* and *R. pileata* develop a rounded swelling upon the top of the head, commencing at the interorbital region and extending backwards towards the occiput. In the former species this is to be seen simply as a swelling beneath the skin, in the latter it is flap–like, with a free margin behind and at the sides. It springs from the anterior extremities of the fronto-parietal bones, which are swollen and markedly pitted at this point. The swelling itself is composed of dense fibrous tissue, and is connected posteriorly to the skin above it by fibrous bands; in the case of *R. pileata* it is closely adherent to the skin all round the free margin of the flap.

The following key, based on adult male characters, will serve to distinguish the various forms:—*

Head not enlarged, no tooth-like projections in the lower jaw *R. doriæ* Blgr.

Head enlarged, lower jaw with tooth-like projections

No postorbital swelling *R. kohchangæ*, nov.

Postorbital swelling rounded, reaching to level of anterior border of tympanum, heels overlapping *R. macrognathus macrognathus* Blgr.

Postorbital swelling elongate, reaching to level of posterior border of tympanum, heels not overlapping *R. macrognathus dabana*, nov.

Postorbital swelling flap-like with a free edge *R. pileata* Blgr.

* The allied *R. plicatella* Stoliczka, has also an occipital knob, but with its characteristic dorsal folds of skin and shorter web to the toes is quite distinct from the forms discussed here.

Rana doriæ Boulenger.

PLATE 9, fig. 1.

Rana doriæ, Bouleng., Ann. Mus. Genov., 1887, (2) v, p. 482, pl. III, fig. I; idem, Fauna Malay Penin., Rept., 1912, p. 231 (in part); idem, Rec. Ind. Mus., 1920, xx, p. 49; Anderson, Journ. Linn. Soc. Zool., 1889, (Fauna of Mergui), xxi, pp. 336, 349; Annandale, Mem. Asiat. Soc. Bengal, 1917, vi, p. 133 (Andaman Ids).

Type locality, Tenasserim. Types in the British Museum.

Distribution. From the type locality southwards through Peninsular Siam to the Malay Peninsula. Undoubted records of this frog appear to be only from Tenasserim, from King and Elphinstone Islands (Mergui Archipelago), from Patiyu (P. Siam) and from the Andamans. Recently I have examined a specimen obtained at Kuala Teku, Gunong Tahan, Malay Peninsula, by the F. M. S. Museums collectors. The Robinson and Kloss expedition to Peninsular Siam in 1919, found this frog fairly common at Victoria Point (S. Tenasserim), and at Mamoh, Tapli, and Tung Pran, and a good series was obtained from these localities. Anderson records it as common on King and Elphinstone Islands.

Colouration. All the examples I have examined from Tenasserim and Siam are of the same colour, the predominating hue being olive brown with lighter and darker markings. The Gunong Tahan specimen is of a reddish-brown above, with small black markings; throat and chest handsomely marbled with brown.

Remarks. The tibio-tarsal articulation in some of my specimens from Peninsular Siam reaches the tip of the snout or beyond.

I have examined two examples from the Andamans kindly sent me by Dr. Annandale (Indian Mus. Nos. 9381, 10436), and they differ from my specimens in the following particulars:—the more anterior position of the vomerine teeth, from the extreme anterior inner borders of the choanae, the more emarginate web to the toes, the shorter, more rounded, inner metatarsal tubercle, and in the presence of a small, but distinct, outer metatarsal tubercle.

Measurements of *Rana doriæ* in mm.

Author's No.	3581	3582	3589	3592	3585	5922
Sex	♂	♀	♂	♀	♀	
Snout to vent	44	46	42	47	47	50
Length of head	16	17	15.5	16.5	17	18
Width of head	18	19	17	18	18	19
Snout	7.5	8	7	7	7	8
Eye	5	5	4.5	5	5	5
Interorbital width ..	4.5	4.5	4	5	4	4
Tympanum	3	3.5	3.5	3.5	4	4
Fore limb	24	28	23	27	27	26
Hind limb	78	86	70	83	86	80
Tibia	26	27	24	28	27	27
Foot	25	25	22	26	26	25
Locality	Tung Pran	Tung Pran	Tapli	Tapli	Mamoh	Ku. Teku

Rana macrognathus macrognathus Boulenger.

PLATE 9, fig. 2.

Rana macrognathus, Bouleng., Ann. & Mag. Nat. Hist., 1917 (8) xx, p. 414; idem., Rec. Ind. Mus., 1920, xx, p. 51.

The confusion between this species and *R. doriæ* which occurred in Boulenger's earlier descriptions (Ann. Mus. Genova, 1893, (2) xiii, p. 238, pl. viii, and Fauna Malay Penin., Rept., 1912, p. 231), has now been cleared by that authority himself.

The types are from the Karen Hills, Burma, and the species extends southwards as far as Lat 6° N. I have seen specimens from the Me Taw forest, W. of Raheng, from De Lisle island and Pulo Rawi off the W. coast of Peninsular Siam, and from the Nakon Sritamarat mountains.

In his recent monograph on the South Asian Ranae, Boulenger has listed under this species (p. 51) specimens of mine from Daban, Ok Yam, and Koh Chang, single examples in each instance. The one from Daban I now refer to *R. m. dabana*, the other two, from Ok Yam and Koh Chang, to *R. kohchangæ*.

Colour in life. Olive greenish or brownish, with darker markings. Throat white, belly and under surface of thighs pale yellow, the two colours usually clearly defined by the fold across the throat. Lips and limbs with dark bars, and a pale bar between the eyes. Iris golden, veined black with a black cross. A broad yellow vertebral stripe occurs in many examples, less often a narrow one.

Remarks. I found this frog common on the Nakon Sritamarat hills (Khao Ram, Khao Ronpibun, Khao Wang Hip) in February, both on the lower levels and up to 700 metres, where water became scarce. It was never found away from streams, and could be heard croaking frequently both by day and by night. Tadpoles abounded in the shallow puddles and pools, and were obtained in all stages of development.

The tadpole. This agrees in all essential characters with that of *R. kohchangæ*.

Two forms were found; a small one in which the length of the body is nearly twice its width and the nostrils are nearer the tip of the snout than the eyes; and a larger one in which the length of the body is about 1½ times its width and the nostrils are equidistant between the snout and the eyes. The second form appears to be one in which, owing probably to better nourishment, a greater development of the body occurs, altering somewhat its proportions. Mouth parts and colouration as in *R. kohchangæ*.

Dimensions of a specimen of the large form:—total length 31, head and body 11.5, depth of tail 5.5 mm. Of the small form:—total length 28, head and body 8.5, tail 3.5 mm.

Measurements of *R. m. macrognathus* in mm.

Author's No.	4410	1586	3894	6069	6070	6071	6073	6080	6078	6081	6084	6085	6088	1584	1585
Sex	♂	♂	♀	♂	♂	♂	♂	♂	♂	♀	♀	♀	♀	♂	♀
Length	49	54	43	54	51	54	55	50	49	48	48	47	49	58	49
Length of head ..	21	21	16	22	22	22	23	20	20	17	18	17.5	18	24	17
Width of head ..	23	24	16.5	25	24	25	24	21	20.5	19	19	18	18	26	19
Snout	9.5	9.5	7	9	9	9.5	10	8.5	9	7.5	8	8	8.5	10	8
Eye	5.5	5.5	4.5	6	6	6	6	6	5.5	5.5	5.5	5	5.5	6.5	5.5
Interorbital width ..	5.5	6	4	6	6	6	6	5.5	5	4	4.5	4	4	6.5	4
Tympanum	7	6	3.5	5.5	6	6	6	6	5.5	4	3.5	3.5	3.5	7.5	3.5
Fore limb	30	27	25	30	29	29	31	27	27	26	27	27	27	32	27
Hind limb	81	86	79	89	88	88	92	84	85	76	79	78	82	96	83
Tibia	29	28	26	31	29	30	30	28	28	26	27	26	27	33	27
Foot	29	27	24	28	27	28	28	26	27	25	25	25	26	31	26
Locality	De Lisle Id.	Me Taw forest Raheng	Me Taw forest Raheng.	Nakon Sritamarat.	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,

Rana macrognathus dabana, subsp. nov.

PLATE 9, fig. 3.

Rana macrognathus (in part), Bouleng., Rec. Ind. Mus., 1920, xx, p. 51.

Types, male, Author's No. 4845, and female, 4842, collected at Daban, 200 metres altitude, Langbian plateau, S. Annam, in March 1918.

Similar to *R. m. macrognathus* Boulenger, but differing in the shorter leg, the heels not, or only just touching each other when the limbs are folded at right angles to the body; and in the longer postorbital swelling, which extends as far as a line connecting the posterior borders of the tympana.

Colour. As in *R. m. macrognathus*, but duller above and greyer below. None has a vertebral stripe.

Five males and one female examined. This frog was found along the banks of the Kronfa river, hiding among damp leaves at the water's edge.

Measurements of *R. m. dabana* in mm.

Author's No.	4845	4842	2637	2547	4844
Sex.	♂	♀	♂	♂	♂
Length	54	39	55	52	51
Length of head	22	14.5	22	22	21
Width of head	25	16.5	26	25	24
Snout	10	6.5	10	10	9.5
Eye	6	5	6	5.5	5.5
Interorbital width	6	3	6	5	5.5
Tympanum	6	3	6	5.5	5.5
Fore limb	30	22	33	30	30
Hind limb	81	60	80	75	75
Tibia	26	20	26	24	25
Foot	26	20	26	24	25

Rana pileata Boulenger.

PLATE 9, fig. 4.

Rana pileata, Bouleng., Journ. N. H. Soc. Siam, 1916, ii, p. 52, pl.—; idem., Rec. Ind. Mus., 1920, xx, p. 52.

This form is the largest of the group, and it has diverged the furthest from the primitive form. In it the head attains a remarkable development, for in addition to the usual cranial enlargement, the postorbital swelling becomes produced as a rounded flap, free behind and at the sides. I have nothing to add to Boulenger's excellent description of this species.

Type locality. Khao Sebab, Chantabun, S. E. Siam. Types in the British Museum.

Measurements of *R. pileata* in mm.

Author's No.	1551	1559	5881	3006	1564	5877	5833	5700	5695	3719
Sex.	♂	♂	♂	♂	♂	♀	♀	♀	♀	♂
Snout to vent ..	64	56	53	52	61	51	59	54	49	44
Length of head ..	26	21	20	23	29	18	21	20	19	18
Width of head ..	31	24	23	25	33	20	24	22	20	20
Snout	11	9	9	9	12	8	9	9	8	7.5
Eye	6.5	6	6	5	6.5	5.5	6	5.5	5	4.5
Interorbital width ..	8	5	5	6.5	8	4	4.5	4.5	4.5	4.5
Tympanum ..	6	5	4	4.5	6.5	4	4.5	4	3.5	4.5
Fore limb ..	35	31	31	27	34	26	33	32	29	24
Hind limb ..	97	87	88	78	90	72	93	90	78	66
Tibia	32	29	29	25	29	24	30	29	26	22
Foot	31	29	29	25	29	24	30	28	26	22
Locality	Khao Sebab.	Khao Pleung.	Pa Meang.	Me Poan.	Me Ing.	Me Song.	Pa Meang.	Muang Liep.	Nong Bua.	Me Taw.

Distribution. Hills of Siam except in the south-west. I have altogether examined some 60 examples from the following localities:—

Khao Sebab and Hup Bon (S. E. Siam); Khao Pleung, Me Song forest, Nong Bua, Me Pooan, Me Wang and Pa Meang (N. Siam); Me Taw forest (N. W. Siam); Muang Liep, Huey Kan Luang and Pon Pissay in French Laos on the Upper Mekong.

The age at which the head of the male reaches its maximum development is not always commensurate with the size of the frog. Specimens 1551, 1564 and 3006 are fully grown, the flap is large with a good free edge, and the general proportions of the head those of maturity. Nos. 1559 and 5881 although also fully grown as regards body length, still have the flap only as a small fold of skin, while the other developments of the head are in proportion. From rough observations which I have been able to make, I believe the cranial enlargement commences during the third year of life.

Rana kohchangæ, sp. nov.

PLATE 9, fig. 5.

Rana doriæ, Smith & Kloss, Journ. N. H. Soc. Siam, Dec. 1915, i, p. 249.

Rana macrognathus (in part), Bouleng, Rec. Ind. Mus., 1920, xx, p. 51.

Types male and female, Author's Nos. 2976 and 2985 respectively. Collected on Koh Chang (Chang Island) in the Inner Gulf of Siam, Oct. 1918. Types presented to the British Museum; paratypes 2978 and 2980 to the Museum of Comparative Zoology, Harvard College.

Description of the male type. Vomerine teeth in two short oblique series, commencing from the posterior borders of the choanae, a little nearer to each other than to the borders of the choanae. Lower jaw with fang-like projections. Head broader than long; snout rounded, scarcely projecting beyond the mouth, longer than the eye; canthus rostralis obtuse, loreal region slightly concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils greater than the interorbital width, which is greater than that of the upper eyelid; tympanum very distinct,

larger than the eye. Fingers moderate, the tips swollen into very small discs, first as long as second, third as long as the snout; subarticular tubercles moderate. Hind limb moderate, the tibio-tarsal articulation reaching to between the eye and the tip of the snout; heels slightly overlapping when the limbs are folded at right angles to the body. Toes moderate, the tips dilated into small but very distinct discs, nearly fully webbed, two phalanges of the fourth toe free. A well marked tarsal fold; inner metatarsal tubercle moderate, half the length of the fifth toe; no outer tubercle.

Skin of the upper parts with rounded glandules or short folds; a strong, curved fold from the eye to the shoulder.

Nasal bones in contact.

Olive brown above, with lighter and darker markings; a pale bar between the eyes; lips and limbs with dark bars. Below yellowish white.

Female, similar to the male, but without any enlargement of the head or tooth-like projections to the lower jaw.

Males with internal vocal sacs.

Variation. Forty examples from the type locality shew but little variation from each other. The first finger may be a little longer than the second; the hind limb in some males reaches only to the eye, while in other (younger) specimens it reaches as far as the nostril.

Two examples have a broad yellow vertebral stripe.

This frog is the smallest of the group. From. *R. doriæ* it differs in the enlargement of the head and tooth-like projections in the lower jaw. From *R. macrognathus* and *R. pileata* in the absence of any postorbital prominence.

Distribution. Besides on Koh Chang this frog has been found on the neighbouring islands of Kut and Mehsi, and on the adjacent mainland at Ok Yam.

Its presence on the mainland, in view of the closely related forms of this group, is of particular interest, for *R. pileata*, with its very distinct occipital flap is found on the same coast only 125 km. distant.

Measurements of *R. kohchangæ* in mm.

Author's No.	2976	2985	2978	2980	2979	2984
Sex.	♂	♀	♂	♀	♂	♀
Snout to vent ..	42	41	42	42	40	39
Length of head ..	17	14	17	15.5	17	14
Width of head ..	18.5	15	19	16	18	15
Snout	7	6	6	6.5	7	6
Eye	4.5	5	5	5.5	5	5
Interorbital width ..	4	3.5	4.5	3	3	3
Tympanum	5	3	5	3	5	2.5
Fore limb	24	23	25	24	22	22
Hind limb	66	65	65	65	62	59
Tibia	21	21	22	22	19	19
Foot	20	20	21	21	18	18

DESCRIPTION OF THE TADPOLE.

Head and body. Length about one and three-quarters times its breadth, much flattened above and below, snout rounded. Nostrils nearer the tip of the snout than the eyes. Eyes looking outwards and upwards. Spiraculum sinistral, much nearer the eye than the vent. Anus dextral.

Mouth. Subterminal, small. Beak edged with black. A fringe of papillae at the sides and below. Upper lip with two series of teeth, the lower one interrupted; lower lip with three series, the uppermost narrowly interrupted, the second continuous and of about the same length, the third only half the length.

Tail. Four times as long as deep, tip pointed; crests moderate, upper and lower about equal.

Colour in life. Reddish or brownish olive, spotted and speckled with darker. Below greyish, uniform.

Measurements of a specimen with the hind legs well developed:—total length 35; head and body 12; depth of tail 5.5 mm.

THE FROGS ALLIED TO RANA DORIÆ.
ADDENDUM.

By MALCOLM. A. SMITH., F.Z.S.

WITH A TEXT FIGURE.

Rana plicatella Stoliczka.

Rana plicatella, Bouleng., Rec. Ind. Mus., 1920. xx, p. 53.

Since the publication of the above article (*ante* pp. 215-225), I have been fortunate in obtaining three adult male examples of *Rana plicatella*. They were caught on Bukit Fraser, Pahang, in the Malay Peninsula at about 1200 metres altitude.

These specimens are larger than any previously known, and shew probably the cranial development in its most extreme degree.



Head of *R. plicatella*, natural size.

Although easily distinguished by its glandular dorsal folds and less fully webbed toes from the other forms allied to it, this frog very clearly belongs to the same group, and must be included in it. The cranial enlargements are of precisely the same nature, the only variation being in the shape of the occipital prominence. This covers about the same area as that of *R. m. macrognathus*, but instead of being only a slight swelling beneath the skin, projects abruptly upwards at its posterior extremity for from 1.5 to 2 mm.

The colouration of the specimens is olive or olive-brownish above with black markings, a black chevron being just distinct; two examples had bright orange shades, in life, upon the arms and legs, and there are black cross bars upon the limbs of all. Below pale sulphur-yellow, the throat and hind limbs speckled with black. Two of the specimens have a broad orange-yellow vertebral line.

This frog appears to be confined to the Malay Peninsula. The type specimen came from Penang or Province Wellesley and is now lost. Flower's specimen came from Penang, and there is one in the British Museum from Singapore. I have another from Gombak, Selangor, a female with ripe ova (No. 1592).

Tadpoles (taken in June), and juveniles just leaving the water, which I identify as those of *Rana plicatella* were also obtained. The larva differs from that of *R. m. macrognathus* and *R. kohchangæ* in the longer and narrower tail, and in that the upper crest does not reach to the root of the tail. I take this opportunity to add some details of description which were omitted previously.

Length of head and body one and a half to one and two-thirds times its breadth. Nostrils a little wider apart than the distance between the eyes, equidistant between them and the tip of the snout. Spiraculum visible both from above and below. Mouth with a single short row of papillae on the sides, with one or two rows of more elongate ones below, not interrupted in the mid-line.

Tail five times as long as deep, the crests somewhat narrow, the upper a little higher than the lower and not reaching to the root of the tail.

Measurements of a specimen with hind legs well developed :—

Total length 34 mm ; head and body 11.5 ; depth of tail 4.5.

The study of this small group of frogs, from an evolutionary point of view is of great interest, for in this case there can hardly be any doubt that they are all derived from the same ancestor. The one doubt refers to *R. doriæ*, which, being the least specialized I have assumed to be the progenitor, but which now, in its lack of cranial enlargement and want of tooth-like projection in the lower jaw, is farther separated from the various members of the group than they are from each other.

Considering the comparatively small area of country over which these frogs are spread, the number of forms which have been evolved is indeed remarkable, and all the more so when we consider that the conditions under which they all live are almost identical.

Measurements of *R. plicatella* in mm.

Author's No.	6510	6511	6512	1592
Sex.	♂	♂	♂	♀
Snout to vent ..	43	43	43	29
Length of head ..	17	16	17	10
Width of head ..	20	20	19.5	11
Snout	7	7	7	4
Eye	4.5	4.5	4.5	3
Interorbital width ..	5.5	5	5.5	2.5
Tympanum	5	4	4.5	3
Fore limb	24	25	24	17
Hind limb	70	75	77	51
Tibia	24	25	26	17
Foot	22	23	24	15

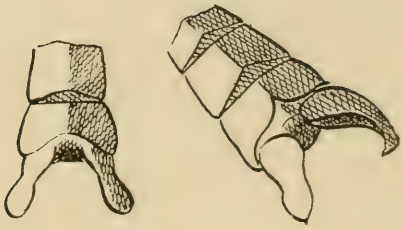


Fig. 1. Anal appendages of *Agriocnemis binocellata*. a. From above. b. Semi-profile.

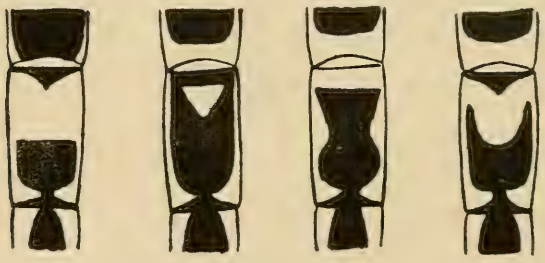


Fig. 2. Dorsal markings of the first and second abdominal segments of—a. *Pseudagrion siamensis* b. *Pseudagrion williamsoni*. c. *Pseudagrion laidlawi*. d. *Pseudagrion bengalense* and *microcephalum*.

A COLLECTION OF DRAGONFLIES FROM BANGKOK.

By Major F. C. Fraser, I. M. S.

With Plate 10.

The collection, which contains five new species, consists of a little over a hundred specimens, and was made during the month of September 1921 by General E. W. Trotter.

I have included also a small collection, sent me in the previous year by Dr. Malcolm Smith.

Of interest is a new species of *Pseudocopera*, the type of the genus being *P. arachnoides* Fraser, collected by Mr. Bainbrigge Fletcher this year at Margherita, Assam. The males of the new species and *P. arachnoides* are almost indistinguishable, but the females vary so much that I have preferred to give the new insect specific rank. The genus will probably be found to be widely spread between the two localities cited. Another insect until now only described from India (Nagpur and Gauhati) is *Agriocnemis d'abreui* Fras., which is represented by two females in the collection. (The latter insect and *Pseudocopera* are described in MS. in the Memoirs of Pusa.)

No notes have been furnished on the list of dragonflies which follows:—

Sub-family **Libellulinæ.**

1. Potomarcha obscura Karsch.
2. Lathrecista asiatica asiatica Kirby.
3. Orthetrum sabina Drury.
4. Diplacodes trivialis Ramb.
5. Brachythemis contaminata Fabr.
6. Crocothemis servilia Drury.
7. Neurothemis fluctuans Fabr.
8. Neurothemis tullia tullia Drury.
9. Acisoma panorpoides panorpoides Ramb.
10. Brachydiplax malcolmi, sp. nov.

Several males and a female from Bangkok, 26.9.21.

Male. Abdomen 24 mm. Hindwing 30 mm.

Head. Lips, epistome and face whitish yellow; frons and vesicle metallic blue; occiput black; eyes olivaceous with a cap of reddish brown above.

Prothorax yellowish.

Thorax warm brown on the dorsum, bright golden yellow laterally, the postero-lateral suture marked finely with brown in its upper two-thirds. The dorsum and lateral markings are pruinescent.

Legs black, the coxae and trochanters bright golden yellow.

Abdomen. The first three basal segments reddish yellow, the apical two-thirds of the third segment deeply pruinosed and almost white on the dorsum, remaining segments warm brown intensifying analwards until quite black. Possibly in the fully adult male all these latter segments are pruinosed but all the specimens before me appear to be fully adult and only show pruinescence on the 3rd segment.

Anal superior appendages as long as the 9th segment (which is nearly 3 times as long as the 10th), narrow at the base, broadening apically where they show a broad, blunt point directed downward, apex pointed.

Inferior appendage triangular, curling upward at the end.

Wings hyaline but faintly enfumed at the apex and warmly saffronated at the base as far out as the 2nd antenodal nervure; reticulation black and prominent; 2 rows of cells in the discoidal field; trigones and hypertrigones entire; one row of cells between *Rspl.* and *Rs*; *Mspl.* poorly developed; divided cells in outer angle of loop only; 7 antenodal nervures and 6 postnodal nervures in forewing, 6 of each in the hind: stigma very large, light yellowish brown.

Genital organs. Lamina broad and very depressed, its free border fringed with yellow hairs; inner tentaculae very broad, very robust, rounded, and short, parrot-beak shaped hooks directed directly inward, the outer short, broad, rounded, not nearly overlapping the lobe; lobe small, elongate, converging in a spiral plane.

Female. Very similar to the male but not pruinescent. Differs as follows:—Thorax uniformly golden yellow marked with an oval spot of brown on the upper part of the humeral suture, a small, obsolete, diffuse spot on the lower part of the first lateral suture and a streak on the postero-lateral. The first and last spots are inclined to be metallic in some lights.

Abdomen reddish yellow, the sutures finely black. First segment with a broadish, subdorsal, black, longitudinal stripe; 3rd with a diffuse, brownish, transverse spot just behind the transverse suture; on the 4th to 8th, posterior to the transverse suture a blackish brown streak incomplete apically, merging on the 7th and 8th with the dark brown which covers most of these segments and the whole of the 9th and 10th.

Anal appendages short, conical, pointed, dark brown.

Genital valves, two small, triangular, leaf-like flaps.

Saffronation of the wings at the base not nearly so marked as in the male.

I have named this species after Dr. Malcolm Smith.

11. Rhyothemis variegata Joh.
12. Rhyothemis phyllis phyllis Sulz.
13. Tholymis tillarga Fabr.
14. Pantala flavescens Fabr.
15. Urothemis signata signata Burm.
16. Zyxomma obtusum Alb.

Sub-family **Gomphinæ**.

17. Ictinus praecox Selys.

Sub-family **Aeschninæ**

18. Anax guttatus Burm.

Sub-family **Coenagrioninæ**.

19. Agriocnemis d'abreui Fraser.
20. Agriocnemis incisa Selys.
21. Agriocnemis binocellata, sp. nov.

(*Fig. I. a* and *b.*)

Male. (Only one specimen.)

Abdomen 24 mm. Hindwing 14 mm.

Head matt black marked with a small, transversely oval, blue spot on either side of the central ocellus, and a large, blue, postocular spot. Labium white, labrum and epistome and cheeks greenish, the former traversed by a broad, black stripe.

Prothorax with the posterior lobe projecting backwards medially in a tongue-like process, black with a yellowish green collar in front and a streak of the same colour on the posterior border limited above by the small, medial lobe mentioned above.

Thorax black on the dorsum marked by a fine, blue, antehumeral stripe, laterally bluish turning to greenish-yellow low down on the sides and marked by a moderately broad, black stripe on the postero-lateral suture.

Abdomen long and slender, black marked with greenish-blue or blue. The 1st segment entirely greenish-blue except for a small, black, quadrate, dorsal spot; 2nd segment has a marking like the spectacles on the hood of a cobra and resembling somewhat that seen in *Agriocnemis d'abreui* and *Agriocnemis clauseni*; the dorsum is black, this colour constricted apically so that only a narrow stem of black remains on the dorsal carina, whilst basally there are two large, subdorsal, blue, oval spots; segments 3 to 6 have long, narrow, subdorsal lines traversing the basal three-fourths of each segment and encroaching on the black at either end so that the enclosed black tapers abruptly at either end and forms a thick, black annule at the apex of each segment; segment 7 has only two small, subdorsal, blue spots at the base; segment 8 is entirely black, and 9 and 10 are entirely azure blue, the latter shallowly notched behind. Superior anal appendages black, paler beneath and inwardly, rather longer than the 10th segment. Viewed from above they are strongly divaricate, swollen at the base and then constricted and again broadening so as to appear slightly clubbed at the apex. Seen from the side they are foliate, the apex turned down abruptly and ending in a small point. The inferior appendages are very tiny and have been too damaged for purposes of examination.

Wings hyaline; stigma rather elongate, blackish, the circumference paler; the arc is situated widely distal to the 2nd antenodal

nervure and more so than is usual even in *Agriocnemis*; the trigones are not very acutely pointed and rather wider than is usual for the genus; 8 postnodal nervures in the forewing, 6 in the hind.

Legs white, the extensor surface of the femora black, as is also the last joint of the tarsus. Tibiæ armed with 3 to 4 long spines on the outer side, with a row of numerous, smaller ones on the inner side. Claw-hooks robust, situated nearly at the end of the claws.

22. Ischnura senegalensis Ramb.

23. Pseudagrion siamensis, sp. nov.

(*Fig 2. a*).

Male. Length of abdomen 30 mm., of hindwing 19 mm.

Head pale sky-blue with a narrow, transverse, black stripe crossing the vertex at the level of the ocelli and throwing a projection back just to the outer side of the ocelli which, meeting the black on the occiput, encloses a large, subtriangular spot of azure blue behind each eye. Eyes dark brown above, greenish below.

Prothorax blue with longitudinal, black, mid-dorsal, sub-dorsal and lateral lines which coalesce anteriorly and posteriorly to enclose spots of the ground colour.

Thorax azure blue, paler at the sides, marked with a mid-dorsal, narrow black stripe and narrow humeral bands of the same colour.

Wings hyaline, stigma lozenge-shaped, blackish; postnodal nervures 9 in the forewing, 7 in the hind.

Abdomen blue on the dorsum, paler on the sides and changing imperceptibly to yellowish below. Segment 1 marked with a dorsal, quadrate, black spot which does not quite reach the apex; segment 2 with a narrow, basal annule, pointed in the middle and an apical, goblet-shaped marking extending only to the middle of the segment, quite square basally and with a very short stem apically where it joins an apical ring; segments 3 to 6 with long, black, dorsal stripes which taper basally and expand apically just before the distal end where they join apical annules; segment 7 similar but with no apical contraction after the expansion; segments 8 and 9

azure blue with narrow, subapical, black annules which are spined; segment 10, the dorsum bearing a large, quadrate, black spot.

Superior anal appendages as long as the 10th segment, strongly bifid at the apex, black, whitish internally, with a robust, basal spur directed downward and inward. Inferior appendages small, short, foliate, white with a minute apical, black point.

Female unknown.

This new species belongs to the group which includes *Pseudagrion bengalense*, *P. microcephalum* and *P. laidlawi*. From the first it is distinguished by having black annules on segments 8 and 9, and by the goblet on the dorsum of the 2nd segment not being hollowed out in front and by the fewer postnodal nervures; from the second by the fewer postnodal nervures and the dorsal marking on the 2nd segment; and from the third by the ground colour being blue instead of lilaceous, by the shape of the dorsal marking on the 2nd segment which is shaped as a thistle-head in *laidlawi*, and lastly by the superior appendage having a basal spine which is absent in *laidlawi*. From *P. williamsoni* it is distinguished by the shape of the marking on the 2nd abdominal segment. *(Fig. 2. b).*

24. Ceriagrion auranticum, sp. nov.

3 males from Bangkok, Aug. 20. 21.

Male. Length of abdomen 27 mm., hindwing 18 mm.

This insect is very similar to two closely related forms:— *C. rubiae* Laid., and *C. erubescens* Selys.

It is to be distinguished from both by the shorter petiolation of the wings, this ceasing distinctly before *ac*. In this respect it differs from all other forms that I have had the opportunity of examining.

The arc is also well distal to the 2nd antenodal nervure, agreeing in this respect with *erubescens*, but differing from *rubiae* in which the are lies opposite the 2nd antenodal.

The ground colour is a much richer orange than in *rubiae* and differs from *erubescens* in which the colouring of the abdomen is crimson.

The stigma is a warm, light reddish brown, almost brick red. Postnodal nervures number 10 in the forewing, 8 in the hind.

The appendages are very similar to those of the related forms, the superior being foliate, triangular as seen from behind and directed downward between the inferior, blackish above. In *rubiae* they lie either directly above or outside the inferior. The inferior are triangular as seen from the side and rapidly taper before the apex which is tipped with black. They are directed almost directly upward.

25. PSEUDOCOPERA TROTTERI, sp. nov.

2 pairs. Sept. 2. 21.

Male. Length of abdomen 36 mm., hindwing 21 mm.

This species closely resembles a pair of dragonflies,—*Pseudocopera arachnoides* Fras. (Mem. of Pusa), collected by Mr. Bainbrigge Fletcher at Margherita, Assam, 14–19.5.1920 which I had the opportunity of examining this year. It is a curious coincidence that another species, closely allied, should be reported so soon and from a locality far distant.

The genus is closely akin to *Coeliccia* from which it differs, however, by the shorter petiolation of the wings, this ceasing proximal to *ac* instead of at *ac*. The two hinder pair of tibiae are also dilated, the hindermost enormously so. Lastly the anal appendages are strongly generic and differ markedly from any found in *Coeliccia*.

The male of this new species differs from *P. arachnoides* by the much shorter length of the abdomen, 36 mm. as against 41 mm. in *arachnoides*, by the fewer postnodal nervures, 13/11 as against 15/13, by the longer and narrower stigma and its darker colour, sepia, and lastly by the 9th abdominal segment being entirely pale blue instead of blue marked with black,

The females of the two species differ rather more markedly and this may be better shown in tabulated form as follows:—

P. trotteri.	*P. arachnoides.*
Abdomen 31·5 mm.	Abdomen 39 mm.
Hindwing 20·5 mm.	Hindwing 24 mm.
Postnodal nervures in forewing 12/13., hindwing 11.	Postnodal nervures in forewing 14/16., hindwing 13.
10th abdominal segment almost entirely blue.	10th abdominal segment almost entirely black.
Markings of head pale creamy.	Markings of head deep ochreous.
Markings of thorax pale blue.	Markings of thorax deep ochreous
Legs white marked with black.	Legs uniform bright ochreous.

The curious and well-defined markings on the head and upper part of the humeral, black band, are exactly the same shape in the two species, as also are the form and colouring of the anal appendages.

26. LESTES sp.

Female only. Closely resembles *L. umbrina* Selys. A male of this form is necessary to settle the identification.

MISCELLANEOUS NOTES

No. I.—Note on the Malay Sambar *(Cervus unicolor equinus.)*

In Vol. I. page 117 of this Journal I described a fine head from Lampang in Northern Siam.

The following are my measurements of a better head in the possession of Mr. W. G. Peiniger:—

Length. Left 37½, Right 37; Circumferences, above coronet 9 inches, above brow tine 7 inches. The greatest outside spread is 31 inches. Mr. Peiniger informs me that he picked up this head, together with four others, in the Me Teun river, Me Ping, Western Siam, some years ago, and that all had been recently killed by wild dogs within a comparatively small area, a striking illustration of the damage done by these red of hunting dogs.

Kemp (Vol. I, p. 51 of this Journal) has alluded to the Sambar's fondness for the fruit of the Makawk tree. One frequently sees small heaps containing 10 to 20 well cleaned Makawk stones (which are the size of a pigeon's egg) far removed from any Makawk tree, and most frequently seen on ridges near, but removed from, Sambar's excrement. The Sambar apparently swallows the fruits whole and ejects the stones later on when ruminating; though at the moment I cannot call to mind any other ruminant which swallows large indigestible stones, though many jungle denizens, Civets for example, pass fruit stones through the body.

The bark of the Makawk tree *(Spondias mangifera)* is astringent like the fruit, though no animals touch the bark.

K. G. Gairdner.

Jan. 15 1922.

No. II.—Intelligence of Otters.

While travelling down the Chumpon river some years ago not many miles from the sea, I encountered a pack of otters. There were ten or twelve of them, and they were moving along at the water's edge, playing about and evidently in search of food. The tide at the time was low, and there was a large expanse of mud between the river and the proper bank. I was loth to shoot one of them for I have kept otters in captivity, and know what fascinating pets they are; but a specimen was badly wanted as very little is known about the distribution of otters in Siam. To judge by their size they were the larger form, *Lutra* species, and not the small clawless one, *Aonyx cinerea.*

I fired at one of the biggest animals but only managed to wound it, and it went up towards the bank evidently to get under

cover of the jungle there. The second shot fared no better except to turn the animal back again towards the water. The rest of the pack were quite unconcerned by the noise, but stopped and stared at us, raising themselves and standing up on their hind legs to get a better view of us.

Then an extraordinary thing happened. The whole pack suddenly surrounded their wounded comrade, and uttering loud cries, four or five of them seized it, and partly lifting, partly dragging, conveyed it over to the bank and disappeared into the jungle beyond. The soft mud at this spot, a broad stretch of 15 to 20 yards, made it impossible to follow them and see what happened afterwards.

MALCOLM SMITH.

Jan. 1922.

No. III.—The Bittern *(Botaurus stellaris)* in Siam.

On March 5th last, I received a specimen of the large bittern *(Botaurus stellaris)* shot by Major Forty at Preng, near Petriu. It appears to be the fourth record of this bird in this part of the world, the other three being from Raheng, Malacca and Singapore respectively *(vide* this Journal, v, p. 81.). The bittern is well known throughout Europe, though nowhere common. In winter it migrates to the Mediterranean, S. W. Asia, India, Burma and China. It is likely that it is more common in Siam than it is thought to be, but it is a shy bird, hiding away during the day time in swampy places among tall reeds, and is thus seldom seen. Major Forty's bird was an old male and very fat, and was excellent eating. The skin is now in my collection.

C. J. AAGAARD.

April, 1922.

No. IV.—The Burmese House Crow *(Corvus splendens insolens)*

Having in mind Gyldenstolpé's statement that this Crow was common in Bangkok, whereas during the past 16 years I have only seen it once in Petchaburi town, I took particular note when coming across from Moulmein to Raheng early this year, as to how far this dreadful bird extended towards Siam. In Moulmein it is of course the commonest and noisiest vertebrate the place supports, and successfully competes for the "chota hazri" laid on the verandah, unless one instantly dashes from bed to table.

It seems to be a maritime or lowland bird, and was entirely absent a few miles East of Kawkarik where the ascent of the Dawna mountains commences, some 40 miles East of Moulmein, being replaced by the ordinary jungle crow.

K. G. GAIRDNER.

March, 1922.

No. V.—Pinus Merkusii. *

In his introduction to "On plants from South Annam" Vol. IV. No. 3 page 114 of this Journal, Kloss denies the occurrence of *Pinus* in the Malay Peninsula "even if we consider this peninsula to commence, as we must if we want to be accurate, at the head of the Gulf of Siam *i. e.* in Lat. N. 13° 30'."

In Vol. I of this Journal page 35, I recorded that "at Khao Pa Lai, south-west of Petchaburi, I found *Pinus Merkusii* at an elevation of 400 metres growing on bare exposed ridges etc..... but the trees were stunted and small, having a diameter of only one-third that given by Brandis." This was in Lat. N. 12° 50', but surveyors of my party reported that this pine grew in the area to the South, approximately Lat. N. 12° 30'.

Khao Pa Lai is outlined on the map facing page 130, Vol. I. of this Journal and is an isolated range situate in the most southerly bend of the Petchaburi river near the Karen village of Song Pi Nong. At the time I noted in Brandis that "the biggest tree seen measured 58 inches circumference and others of three feet were seen growing on bare slopes from 600 up to 1300 feet elevation."

Since recording the above I have seen *P. Merkusii* on Doi Sutep, Chiengmai, at 3800 to 4500 feet elevation on granite. It is also distributed in the forest in which I am stationed here in Raheng (Lat. N. 17° Long E. 99°) growing on shale and granite at 1300 to 2500 feet, and on granite to 3600 feet where the drainage is good.

Lack of humus, drainage, and probably also absence of jungle fires have, I think, more to do with the distribution of this pine than has elevation, as in the three areas mentioned it grows on knife-edge ridges or steep hillsides affording little lodgment for dead leaves, grasses, or other inflammable material. On the Tenasserim side from Moulmein or Myawaddy (Brandis' southerly record) southwards, the rainfall is probably too heavy for pines, whereas for Raheng district it is only 41 inches.

K. G. Gairdner.

March. 1922.

* Siamese = *Ton son*. Laos = *Ton kiah*.

REVIEW.

We are in receipt of "The Snakes of Ceylon" by Col. F. Wall., C.M.G., I.M.S., a fair sized volume of 581 pages. As a popular account of the snakes of the Island with its voluminous notes upon the feeding, breeding, and other habits of the species found there, it is a valuable and interesting work. The author has drawn freely from his own large experience, and has spared no pains to make the life history of each species as complete as possible.

A full account is also given of the poisonous forms, and the symptoms, diagnosis and treatment of the various types of snake poison are discussed at length. In this respect the work should be valuable to the medical practitioners, not only of Ceylon, but of all India as well, for in the matter of poisonous snakes the two countries have much in common.

An attempt has been made to supply the amateur with a ready method of identification, but we doubt if any system can produce reliable results without far greater study than the average man is prepared to give.

On turning to the more scientific side of the book, however, we are disappointed. A list of synonyms accompanies each species, but without the authors names or references attached it is of little value. Nor do we think that Col. Wall's changes in nomenclature will meet with general approval. In his treatment of the sea-snakes in particular there is much ground for discussion.

Nor, lastly, can we agree with Col. Wall, not alone among authors in this respect, when, having accepted the correctness of a name he refrains from using it on the grounds that the one now in use has grown familiar and is best retained. Science is for all time, and the sentimental considerations of a passing generation should not be allowed to affect our views and obscure the truth.

PROCEEDINGS OF THE SOCIETY,

9TH ANNUAL GENERAL MEETING.

This was held at the Bangkok Times Office on March 8th, 1922, and was attended by 18 members and 3 guests. The Vice-president, Dr. M. A. Smith presided.

The minutes of the previous General Meeting having been read and confirmed, Dr. Smith presented the statement of accounts for the past year, and reported on the work of the Society during that period. He mentioned that this had not been as great as in previous years, owing to the fact that several of the most active members were absent on leave. He mentioned also that two newly joined members of the Society were botanists and would be glad to assist any others who might care to take up this study.

The accounts were then adopted, and the election of officers for the ensuing year took place. The result was as follows:—

President: Dr. M. A. Smith.

Vice-president: Mr. E. J. Godfrey.

Hon. Secretary and Treasurer: Mr. A. Marcan.

The committee consisting of the above-mentioned together with Messrs. S. G. Lambert and C. J. Aagaard.

A vote of thanks was passed to the retiring Hon. Secretary and Treasurer, Mr. S. H. Cole. Dr. Smith and Mr. Godfrey were elected co-editors of the Journal.

The Chairman then referred to a question of amalgamation with the Siam Society which had arisen and was under consideration between the committee of the Natural History Society and delegates from the Siam Society. He pointed out that it was not open to the members at the present meeting to do more than discuss the matter, and that voting could only take place after the matter had been fully considered by every member of the Natural History Society.

He outlined the advantages and disadvantages to the Society of amalgamation, stating that whereas, on the one hand, the Journal of the Society would reach a larger number of people, and it might be possible with the conjoint funds of the Societies to rent or obtain a room for the permanent and exclusive use of the members of the two Societies,—on the other hand, the Natural History Society would lose its identity, and in particular its Journal would thenceforth be published under the name of the Siam Society. There would also not be the complete independence of control over natural history matters that they had while existing as a separate Society. However, it would be insisted upon, on behalf of the Natural History Society, that, in case of amal-

gamation the section of Natural History would continue to publish its papers separately and not interspersed with the Siam Society's usual papers.

Mr. Brewitt Taylor suggested that it would be better to defer the question of amalgamation until the Natural History Society was in need of the help which such amalgamation might bring, and that such did not appear to be the case at present.

No further remarks being offered, the business part of the meeting concluded, and a display of specimens followed.

Mrs. Malcolm Smith exhibited specimens of fish obtained in and around Bangkok; Mr. A. Marcan exhibited a specimen of a new tree (*Bignonia* species) found in Bangkok, which would shortly be described. Mom Luang Pé exhibited a living specimen of the Golden Cat (*F. chaus*), and Dr. Smith exhibited some live reptiles and batrachians that he had recently obtained in the Nakon Sritamarat hills.

10th Annual General Meeting.

This was held after dinner at the British Club on July 4th, 1922, and was attended by 14 members and 4 guests.

Dr. Smith shewed a specimen of the Yellow-headed Krait (*Bungarus flaviceps*) which he had recently obtained in the Nakon Sritamarat mountains, and compared it with the other two species of Krait found in Siam. He shewed also a series of the frogs allied to *Rana doriæ*, and pointed out the remarkable changes which had taken place in the various members of the group in the course of evolution.

He exhibited also specimens of a new frog (*Rana cataracta*) from the Nakon Sritamarat mountains and the mountains of Pahang, which would shortly be described.

Major W. R. S. Ladell then read a paper upon "The Chemistry of Plant Life," being the first of a proposed series showing the relationships between the chemistry of plant and the chemistry of animal life. A number of experiments were shown indicating the general composition of leaves and seeds; (1) water (2) carbon (3) nitrogen (4) mineral matter.

The composition of the combustible portion of plant tissues was dealt with briefly, and the importance of carbohydrates, proteins, oils and fats, emphasised. The changes occurring during the growth of plants from the seed were considered generally, experiments being shown relative to the conditions necessary for the proper germination of seeds, (1) moisture required (2) air is essential (3) the seed changes the air from a supporter to a non-supporter of combustion, oxygen being replaced by carbon dioxide (4) heat is evolved during germination.

Ewart's work on the longevity of seeds was touched on. The inhibiting effect of carbon dioxide on the germination of seeds was mentioned. Details were given of various methods for storage and preservation of seeds in damp and tropical climates. The importance of enzyme action, illustrated by the conversion of starch into sugar by saliva. Structure and use of the leaf. Experiments illustrating assimilation, formation of starch in daylight, and its removal in the dark. Plants purify the atmosphere for animal life by absorbing the carbon dioxide and replenishing the oxygen. The processes of respiration and transpiration were shown practically. Transpiration coefficient.

The structure and use of the root. How the plant absorbs mineral matter from the soil by osmosis. General nature of the mineral matter as represented by the ash of plants.

PUBLICATIONS IN THE LIBRARY OF THE NATURAL HISTORY SOCIETY OF SIAM.

The Society's Library is at present located in the Bangkok Times Building. Applications for the keys may be made there at any time between 8 a.m. and 5 p.m. Members are requested to enter in the book kept for the purpose, the name of the publication borrowed, with the date when taken out and returned.

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